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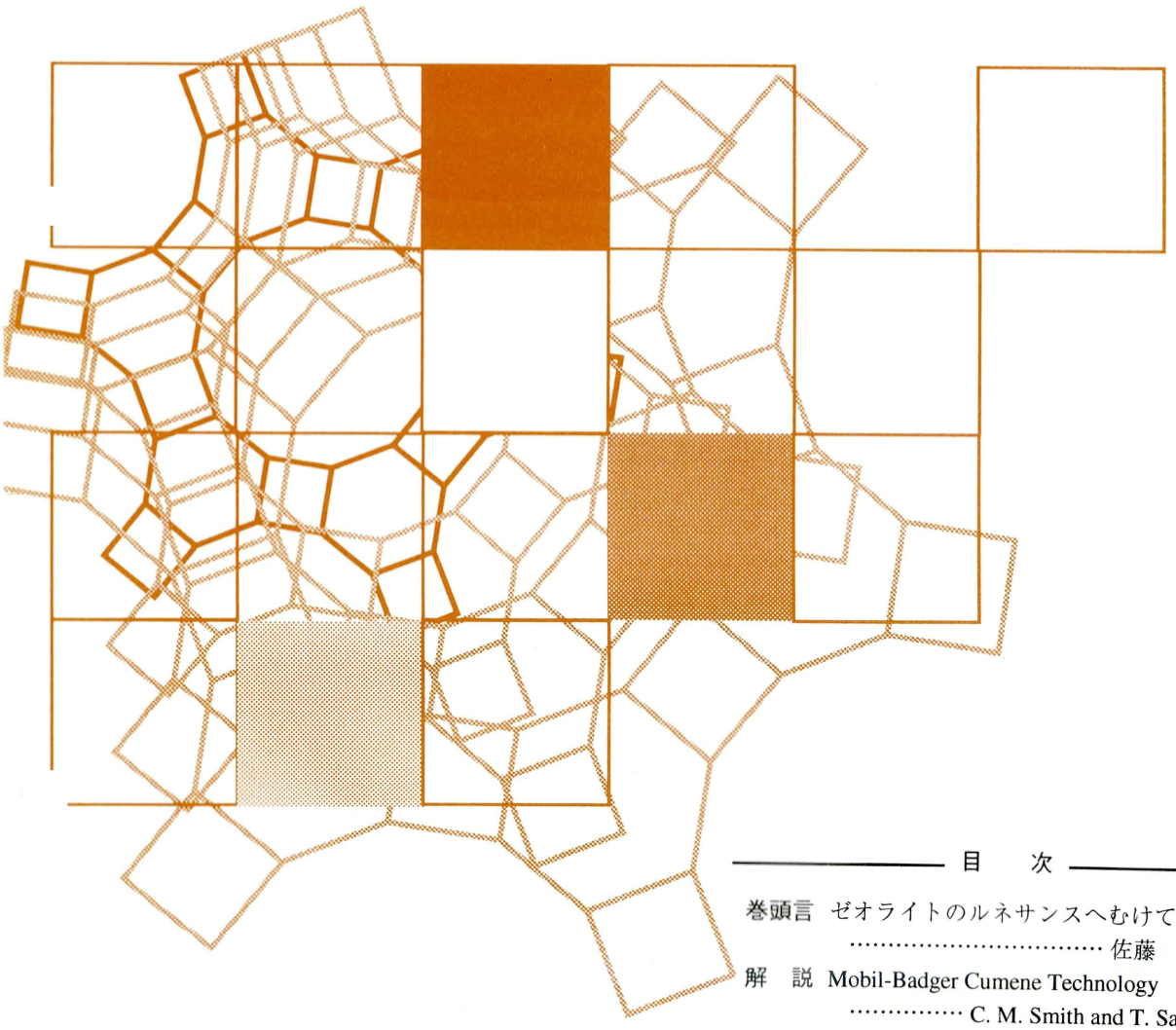

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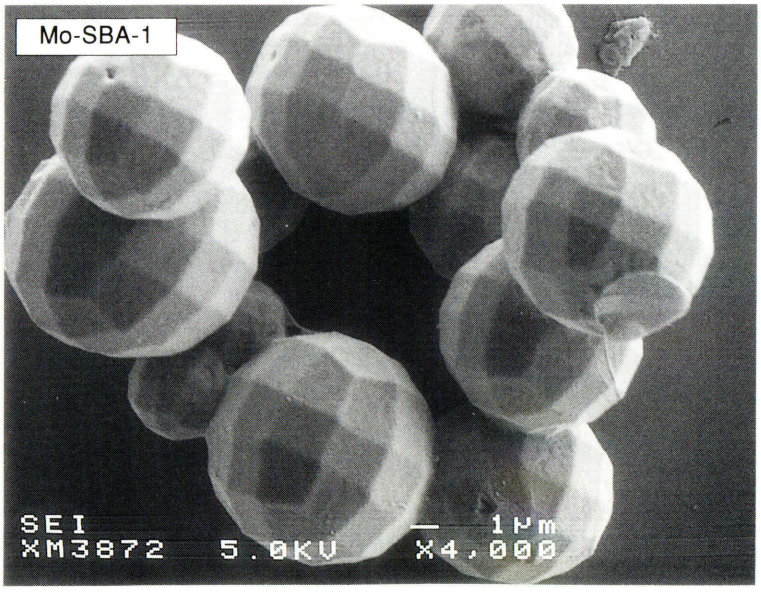

酸性条件下，直接方法で合成したMo-SBA-1の粒子

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横浜国立大学機器分析センター　島田保昌）

《 巻頭言 》

ゼオライトのルネサンスへむけて

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佐藤 洋 (ゼオライト学会 副会長)

明けましておめでとうございます。皆様それぞれの夢と希望を託した新千年紀の幕開けです。元旦のテレビは世界各地でのミレニアムを祝う様子を華やかに映し出しておりました。この慶びと願いを永続させうる人類の英知を信じたいと思います。かけがえの無い地球と人類の共生を願います。そしてこの歴史的時期に遭遇した偶然を自ら祝いたいと思います。

ゼオライト学会も，1984年のゼオライト研究会としての発足以来16年目を迎えました。まだまだ若い学会ですが，ここに至る歴史を顧みますと“ゼオライト”の良き時代を生きてきた様に思われます。MFI型ゼオライト（ZSM-5等）の世界規模での爆発的応用展開とそのキャラクタリゼーションの進展，更には数々の新規合成ゼオライトの発明が続き，世界のゼオライト科学が黄金時代を体験しました。同時に日本のゼオライト学会も活気に満ちた産学協同の実を挙げて参りました。実用面の多様性から産業界はゼオライトプロセス開発に多大の研究投資を行い，アカデミアはゼオライト科学の開拓と体系化に貢献して参りました。その産学接点の場としてのゼオライト学会は産官学メンバーの相互研鑽の実を挙げて参りました。ゼオライト様物質としてのメソポーラス・マテリアル科学の進展にも貢献して参りました。また国際ゼオライト会議やZMPC国際会議を主催するなど，国際交流にも貢献して参りました。そしてこれら学会活動の支援・広報の場としての本誌「ゼオライト」がある訳です。

この様に順調な発展をしてきた本学会もここ2，3年は産業界の不況の波をもろに受け，法人会員の維持が緊急の課題となっております。いかにして魅力ある学会とするかが問われております。そのためには新機軸の導入により学会諸活動を活性化すると共に，本誌の充実も必須であります。また関連学会である触媒学会や石油学会との棲み分けを真剣に議論する必要もあるでしょう。これらの諸問題を学会各層で真摯に議論して頂きたく思います。

更に根本的問題としては，ゼオライト科学・技術の成熟の問題があります。華やかな成長の時期を過ぎて熟年の季節に入ったゼオライト科学・技術をどう発展させるかの課題であります。産業技術としてみれば，これまで日本で実用化されたゼオライトプロセスは十指に余ります。更に企業化検討中のプロセスも相当数に上ると推定されます。これら産側の技術を支えるゼオライト基礎技術と共に，企業の抱える解決すべき諸課題の学会レベルでの公表が待たれます。科学の発展はスパイラル状に上昇すると言われております。産業界の技術・課題を学会レベルで科学的に議論することによりアカデミアでの新たな独創的研究展開を促し，次のステップへと押し上げるのです。国際競争に勝つためには個を守りつつ（個を捨ててとは申しません）共通基盤の底上げを図らねばなりません。産業界の開かれた姿勢を強く切望致します。一方，アカデミアに対しては，産業界の後追い様研究や重箱隅突き研究から脱却し，真の独創性を追及して欲しいと思います。日本発のゼオライト関連独創技術は多々あります。一例を挙げれば，メソポーラスFSMの発見や強磁性を示すアルカリ金属クラスター（ゼオライト中）の発見，あるいはNO_x還元用ゼオライト触媒の開発等があります。こういった世界に冠たる独創研究が沸々と湧き出る学会であって欲しいと願います。産学双方の努力が相俟ってゼオライト研究の一層の活性化を促し，ひいては本学会の発展に繋がるものと確信致します。

最後になりましたがゼオライト学会の更なる発展と会員諸兄の益々のご活躍を祈念致しまして巻頭のご挨拶とさせて頂きます。

《解 説》

Mobil-Badger Cumene Technology

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*ExxonMobil Chemical Company, **Mobil Catalysts Corporation of Japan

The Mobil-Badger Cumene process developed jointly with Raytheon Engineers and Constructors uses a highly selective proprietary ExxonMobil zeolite, MCM-22. This zeolite is exceptionally selective for the alkylation of benzene wit propylene over other zeolites allowing it to be used at benzene-to-propylene ratios below 3:1 molar. The use of MCM-22 benefits the cumene producer by allowing production of high-purity cumene at high yields, as well as providing large increases in plant capacity and improved utility consumption. The first commercial operation of the new technology began in May 1996 and currently operated plants supply approximately half of worldwide cumene demand.
Keywords: Cumene, MCM-22, Mobil-Badger

1. Introduction

In 1993 Mobil Technology Company and Raytheon Engineers and Constructors announced a step-out technology for cumene production, based on Mobil's new MCM-22 zeolite. This technology promised to solve virtually all of the deficiencies of the conventional phosphoric acid process used predominantly at the time. Cumene producers and users indicated that they wanted higher purity, higher yields, effective transalkylation to reduce byproduct losses, low capital investment, reduced utilities, and the ability to use refinery-grade feedstocks.

The ne ocess was designed to meet these multiple objectives, and the Mobil-Badger Cumene process was first licensed by Georgia Gulf Corporation of Pasadena, Texas in December 1994. Within 24 months, the Mobil-Badger cumene technology was licensed to 3 more US producers and 3 European producers with combined nameplate capacity of about 3.1 million metric tonnes per year, —today these seven plants supply approximately half of worldwide cumene demand. Borealis Polymers Oy of Porvoo, Finland started the first plant to operate at a lower 3-to-1 benzene-propylene ratio in October 1997. By 2001 when another 3 plants begin operation, total nameplate capacity for the Mobil-Badger Cumene process will increase to 4.3 million metric tonnes.

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2. Process Description

2.1. Key Features

The Mobil-Badger Cumene process employs extremely selective catalysts for the primary alkylation and transalkylation reactions that produce cumene (Fig.1). Side reactions such as oligomerization, olefin cracking and β scission are essentially non-existent in the Mobil-Badger process (Fig.2). Such side reactions, typical of conventional and other nonselective zeolite-based processes, lead to ethylbenzene and butylbenzene byproducts which can contaminate the product cumene, as well as hexylbenzenes and other heavy residues that lower yield.

This highly selective reaction sequence leads

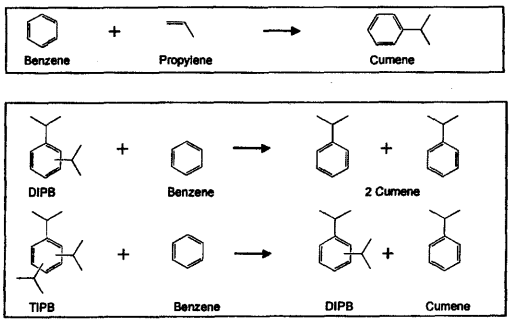

Fig.1 Primary alkylation and transalkylation chemistry for cumene production.

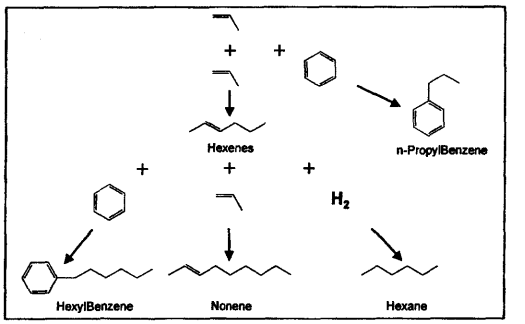

Fig.2 Side reactions typical for the acid catalyzed reaction of benzene with propylene.

to low capital investment in the fractionation section, and reduces coke-forming reactions which shorten catalyst cycle length. A key result of the selective nature of the catalyst is the ability to design the process for exceptionally low benzene-to-propylene ratios (in the range of 2 to 4 molar). This improves utility consumption while providing the potential to substantially increase plant capacity.

The process can be applied to revamp applications of either phosphoric acid or aluminum chloride catalyzed units. In those cases, it may be directly refitted into the existing reactors and plant configuration. However, in a grass-roots design, Fig.3, it uses simple fixed-bed reactors for both alkylation and transalkylation. A portion of the effluent from the alkylation reactors is recirculated through heat exchange directly back to the reactor inlet to control the heat of reaction. Products from the alkylation and transalkylation reactors are then fed to the fractionation system.

Fractionation requirements are largely dictated by the quality of the feedstocks. Base product fractionation requires only three columns for (1) benzene which is recycled in the process, (2) the cumene product, and (3) diisopropylbenzenes (DIPB), which are fed with benzene back to the transalkylator to produce additional cumene. If refinery grade propylene is used, the addition of a small depropanizer tower may be needed to recover LPG. Other fractionation requirements are set by the presence of feedstock impurities, e.g. significant amounts of ethylene or butenes in the propylene feedstock or toluene in the benzene feedstock. The process does not make significant amounts of either ethylbenzene (EB) or butylbenzenes (BB), and therefore the cumene recovery tower can normally be designed for the easy fractionation of cumene from diisopropylbenzenes. If there are significant levels of ethylene or butylene in the feed, removing these contaminants by using an optional propylene prefractionator can be more efficient than removing their resulting by-products, EB and BB from the cumene. Toluene in the feed will produce cymenes – if these impurities are present, the fractionation system can be designed to remove them in a purge from the DIPB tower overhead.

2.2. MCM-22 Catalyst for Alkylation

MCM-22 is well recognized as the best alkylation catalyst for cumene and EB synthesis. Although many acid catalysts can promote these alkylation reactions, medium pore zeolites (*e.g.* ZSM-5) are not large enough to show good overall reaction rates in the liquid phase and are unselective in the vapor phase. In both cases, the size of the molecules and the use of lower temperature liquid-phase conditions leads to the choice of large pore zeolites (*e.g.* MCM-22, Mordenite, β and Y) to overcome diffusion constraints. The similarities end there, however since the choice of catalyst to produce cumene and EB are strongly influenced by different

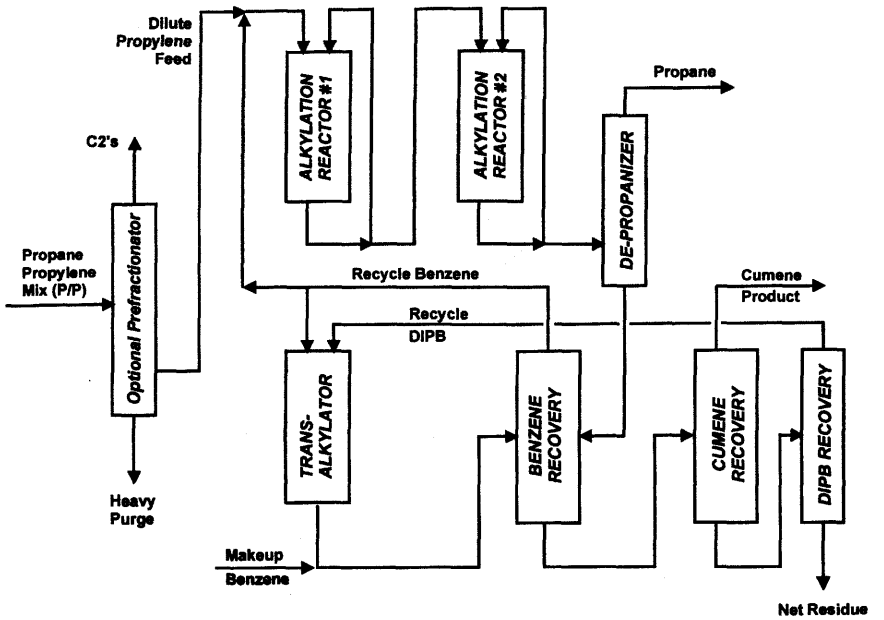

Fig.3 Grassroots Mobil-Badger cumene plant.

factors. Selectivity to the monoalkylated product is of importance in EB whereas ethylene oligomerization is a secondary factor.

Propylene oligomerization is of primary importance in cumene synthesis because propylene reacts 2 to 3 orders of magnitude faster than ethylene over Bronsted acid catalysts. This unselective chemistry occurs readily over conventional solid phosphoric acid (SPA) catalysts and large pore zeolites, forcing a process design that reduces the impact of oligomerization on byproduct formation and catalyst aging. The usual approach maximizes aromatics-to-olefin ratio in the bulk phase surrounding the catalyst via complex catalytic distillation technology or utility-intensive high benzene recycle levels.

Mobil adopted a very severe catalyst screening test early in its program to develop a new cumene process technology. A single-pass single-stage fixed bed alkylation experiment was set up at low-temperature liquid-phase conditions and at a 3-to-1 benzene-to-propylene mole ratio. In this test, conventional large pore zeolites aged at accelerated rates and produced a poor-quality cumene product. Only MCM-22 exhibited stable activity and produced a high quality product in this accelerated test. Other catalysts that showed limited potential for cumene production in this test were zeolites β and ZSM-12 although both these catalysts aged rapidly. Today, the only zeolite catalysts used for commercial cumene production are based on MCM-22 and zeolite β.

The very facile propylene oligomerization reaction causes coke formation and catalyst deactivation via bandwise aging through the catalyst bed. It leads to increased impurities in the cumene product through associated side reactions. It reduces cumene yield since propylene is not selectively converted to alkylated product, and it leads to increased utilities and capital in the plant design to compensate for these deficiencies. The selectivity of MCM-22 allows for stable operation and makes these compromises unnecessary.

The first plots in Fig.4 illustrate the reaction extent (measured as temperature since this is an exothermic reaction) versus bed depth. The second pair of plots illustrate how the reaction profile changes with increasing time. In the case of MCM-22 the curve flattens slightly showing a

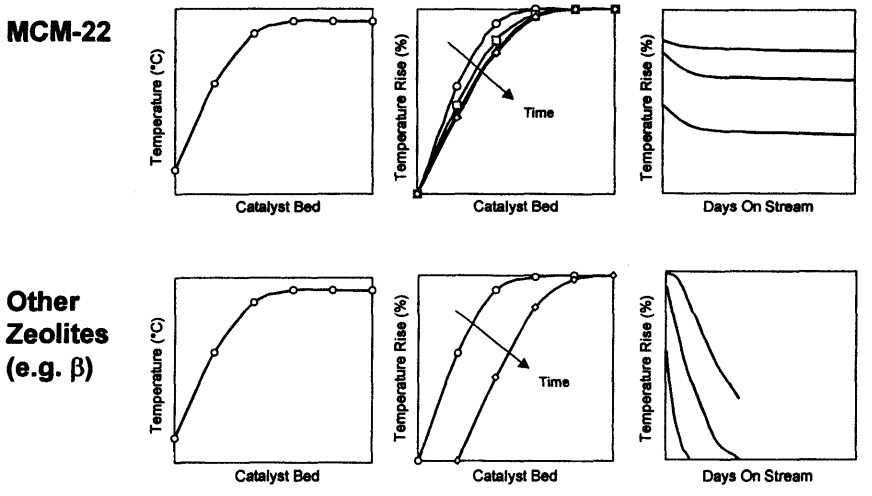

Fig.4 MCM-22 reaches steady state activity compared to other zeolites which show rapid bandwise aging.

uniform aging pattern; in the case of other zeolites, a reaction front moves down the bed leaving a "dead" zone behind it — this is bandwise aging. The last pair of figures shows that performance can easily be tracked by measuring the percent temperature rise at fixed points in the catalyst bed. Whereas the figure shows stable operation with MCM-22, all other solid acid catalysts will require cyclic operation. Increasing temperature during the cycle and/or using a cyclic catalyst reactivation procedure are common methods of dealing with this type of rapid aging. Although increased operational severity that results at the end-of-cycle will help restore activity, it can also degrade product purity since it promotes byproduct reactions.

Zeolite β ages much more rapidly than MCM-22 under the test conditions, and consequently, propylene conversion is changing with time in the test using zeolite β. Propylene conversion is about 94% in the material balance shown below compared with MCM-22 at a higher level of 98%. Even though this conversion difference is not reflected in the total product selectivity, the cumene selectivity is still more than 5% lower with β than it is with MCM-22. In addition, zeolite β produces more than

Table 1 Propylene conversion and selectivities of MCM-22 and zeolite β.

	MCM-22	Zeolite β
Propylene Conversion*	98.0	94.4
Benzene: C_3=, Mole Ratio	3	3
Total Product Selectibity, wt%		
C_3= Oligomers	1.7	9.2
Cumene	84.9	79.1
PIPBs	13.4	11.7
PIPB/Cumene (m/m) %	11.3	10.8
C_3= Balance, Liquid Product, wt%		
C_3= Oligomers	4.7	21.4
ΣAlkylated Product	95.3	78.6

*Propylene conversion is not complete since this is a once-through test at high space velocity.

5 times the propylene oligomers produced when using MCM-22. From the propylene balance on the liquid product, zeolite β directs over 20% of propylene fed to the test unit into propylene oligomers. Thus, using zeolite β results in a substantially reduced selectivity to alkylated products, 78% down from 95% for MCM-22. The slightly lower polyisopropylbenzene (PIPB) selectivity with zeolite β probably reflects some size exclusion selectivity from the pore system. Table 1 summarizes propylene conversion and selectivities of MCM-22

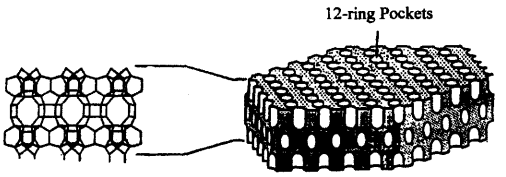

Fig.5 Schematic illustration of a single layer hexagonal crystallite of MCM-22 showing surface pockets.

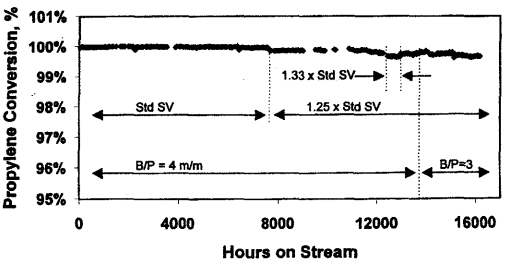

Fig.6 Pilot plant results demonstrate exceptional alkylator-stability even at low benzene-to-propylene ratio.

and zeolite β.

The much lower selectivity for propylene oligomerization over MCM-22 compared to all other conventional zeolites is a result of its unusual structure. Fig.5 shows schematic illustration of a single-layer hexagonal crystallite of MCM-22 having surface pockets. The pockets in MCM-22 show an exceptionally strong affinity for aromatic hydrocarbons over olefins, and these pockets are also the sites of the alkylation reaction. In conventional zeolites, shape selectivity is the result of molecular interactions with a constrained pore system by (1) size exclusion, (2) reduced diffusivity, or (3) restricted transition states. A completely different mechanism based on understanding the effect catalyst structure has on adsorption-desorption equilibria must be considered to explain the selectivity of MCM-22. Computational modeling has confirmed that the pockets in MCM-22 are 3 times more likely to contain benzene than the pores of zeolite β. Therefore, the catalytic sites of MCM-22 are preferentially occupied by aromatics even when the benzene-to-propylene ratio in the bulk phase is quite low. This is why propylene oligomerization is suppressed, and explains why MCM-22 is so uniquely effective for the alkylation of benzene to produce cumene.

3. Pilot Plant Operation

Extensive pilot plant data has been obtained to verify the performance characteristics of the Mobil-Badger process. Since the commercial process is highly integrated, all aspects of the process were incorporated into the pilot plant including alkylation, transalkylation, and on-line fractionation. With this type of highly integrated experimental design, minor byproducts will accumulate in the same way they do in commercial operation. As a result, their impact on catalyst aging and product purity can be determined.

The alkylation catalyst has been tested on refinery-grade, chemical-grade and polymer-grade propylene with refinery grade benzene from a variety of sources. For single stage operation, Fig.6 shows that propylene conversion has changed little at constant reaction temperature; dropping from essentially complete conversion to 99.9% after 16,000 hours on stream. Conversion remained stable even though space velocity (SV) was increased at about 8000 hours and Benzene-to-Propylene mole (B/P) ratio was reduced from 4 to 3. Additional work has shown that MCM-22 can operate stably at B/P ratios of 2 and below.

During parametric studies, a temporary lowering of alkylation activity due to the presence of water in the feed was observed. Water lowers activity by competitive adsorption on catalytic sites; alkylation activity is fully recovered after water is removed from the feed. Other feed contaminants, notably basic nitrogen, act as irreversible poisons where the activity could only be recovered after catalyst regeneration. Such behavior is typical of all zeolites.

The transalkylation catalyst has undergone aging tests using diisopropylbenzene and benzene feedstocks derived from the alkylation section of

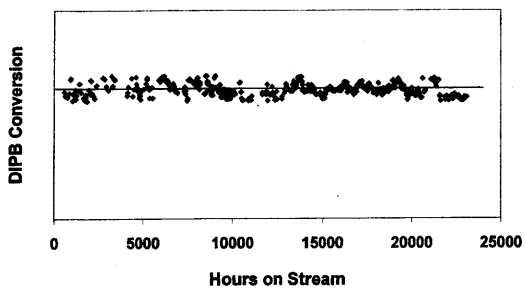

Fig.7 Pilot plant results demonstrate transalkylator-stability.

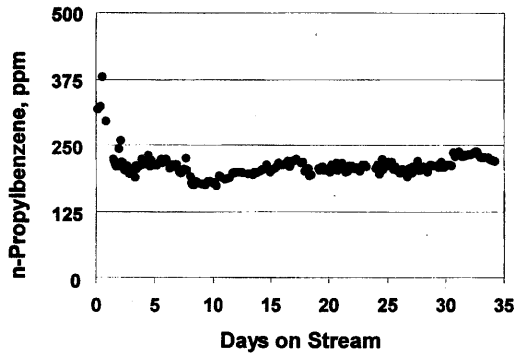

Fig.8 Commercial operation shows production capability at NPB levels below 250 ppm.

Table 2 Cumene purity level in the absence of feedstock contaminants.

	MCM-22
Cumene Purity, wt%	99.98
Impurities, wt ppm	
n-Propylbenzene	170
Ethylbenzene	20
Butylbenzene	20
Cymenes	None Detected

the pilot plant. Conversion varies above and below the target conversion shown in Fig.7; this is due to minor parametric changes in operating conditions. However, at fixed conditions, there is no measurable aging over the course of the 20,000 hours of accumulated stream data.

In addition to the excellent stability shown by MCM-22, work with chemical grade propylene demonstrates the very high overall selectivity of the Mobil-Badger process for alkylation and transalkylation compared to those reactions that lead to byproduct formation. In the absence of benzene and propylene feed impurities, Table 2 shows that the expected cumene purity levels are exceptionally high, 99.98 wt%. The Bromine Index, a measure of the presence of olefins, is always <5 indicating the absence of these impurities.

4. Commercial Experience and Licensing Status

The first commercial operation was refitted into a plant that previously used solid phosphoric acid technology. This plant, operated by Georgia Gulf in Pasadena, Texas was recommissioned with the new Mobil-Badger technology in May 1996 at a design capacity of 1.5 billion pounds per year and a benzene-to-propylene ratio of 4 m/m. The MCM-22 catalyst has performed well at Georgia Gulf on pipeline grade propylene available in the U.S. Gulf Coast; over 30 months of continuous alkylation service has been achieved without catalyst reactivation or regeneration. Transalkylation catalyst has been in continuous service since startup in 1996.

After initial startup, Georgia Gulf demonstrated that NPB could be controlled to levels below 250 ppm (Fig.8) when producing cumene from refinery grade feedstocks. There are several sources of n-propylbenzene (NPB) impurities in the cumene product. It is produced in both the direct alkylation of benzene with propylene and in the transalkylation of DIPB with benzene to produce cumene. In addition, about half of the cyclopropane, a reactive component present in propylene feedstocks is converted to NPB; the rest is converted to cumene. Although the conversion selectivity of cyclopropane cannot be controlled, NPB in the Mobil-Badger process can be controlled by keeping alkylation and transalkylation temperatures low. The exceptional stability of the MCM-22 catalyst is a major factor in maintaining low NPB levels throughout long

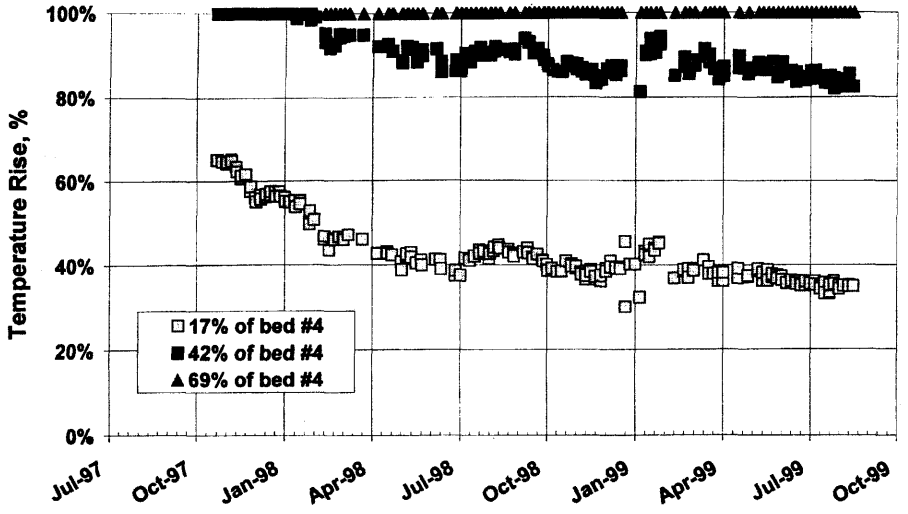

Fig.9 Borealis alkylator performance is stable for 2 years at 3:1 m/m benzene-to-propylene ratio.

Table 3 Georgia Gulf test run.

	Georgia Gulf Test Run*
Cumene Purity, wt%	99.97
Impurities, wt ppm	
n-Propylbenzene	200
Ethylbenzene	25
Butylbenzene	15
Bromine Index	<5

*June 1996.

operating cycles.

Ethylbenzene (EB) and butylbenzenes (BB) are also important contaminants that are controlled in the manufacture of cumene. These byproducts, produced by acid catalyzed propylene oligomerization followed by oligomer cracking and aromatics alkylation, are largely suppressed over MCM-22. MCM-22's very high affinity for aromatics limits propylene adsorption on catalyst's surface. Therefore, the Mobil catalyst shows very high alkylation selectivity even at low aromatics to olefins ratios in the reaction mixture. This has been demonstrated in the commercial data in which EB typically tracks to about 30 ppm and BB typically tracks to about 10 ppm.

A 72 hour performance test was conducted at Georgia Gulf in mid-June 1996. Table 3 shows the result of the test run at about 105% of guaranteed design capacity. The seven original plants, all now operating, have exceeded their guarantees; greater than expected cumene purity levels have been achieved at greater than design throughput in every case.

Borealis was the first plant to begin operating at a benzene-to-propylene ratio of 3 m/m using the Mobil-Badger process. This unit was originally constructed using conventional SPA technology, and later converted to $AlCl_3$ to increase capacity. The conversion to the Mobil-Badger process used the original multistage SPA reactor to provide Borealis with additional capacity without increasing benzene circulation. Both the alkylation and transalkylation catalysts have now been operated continuously for 24 months, since October of 1997, with no apparent activity loss after the initial break-in period. Fig.9 shows the percent temperature rise at three points through Bed #4 of the Borealis reactor (refer to Fig.4 which describes the expected pattern with MCM-22 versus other acid catalysts).

During the first six months of operation, a steady state activity level was achieved in which

Table 4 Commercial status of Mobil-Badger cumene technology.

	Location	Benzene/ Propylene	Months Onstream	Capacity MTA
Georgia Gulf	USA	4:1	40	680
Koch	USA	4:1	26	630
Borealis	Finland	3:1	23	190
Citgo	USA	4:1	22	540
Caproleuna	Germany	4:1	17	270
Ertisa (CEPSA)	Spain	3.2:1	16	430
Sun	USA	4:1	13	385
Undisclosed	Asia	3:1	2001*	-
Undisclosed	Asia	3:1	2001*	-
Undisclosed	USA	2.5:1	2001*	-

*Expected Startup Date.

about 90% conversion occurs at 42% bed depth; this level remains steady thereafter. Although small variations in activity did occur in 1998, catalyst activity recovers, —this is most likely the result of intermittently high water levels in the feedstock. The Borealis data vividly demonstrates the unique capacity of MCM-22 to prevent the propylene oligomerization chemistry that leads to bandwise aging (see Fig.4) over all other solid acid and zeolite catalysts.

Table 4 lists licensed plants currently operating and expected to startup by 2001 using the Mobil-Badger cumene process. Today, these plants represent more than 10 years of combined commercial operating experience. Catalyst life cycle performance has been proven, with commercial operation at benzene-to-propylene (B/P) ratios as low as 3 m/m. Mobil continues to develop next generation catalysts that will extend cumene performance to B/P ratios at and below 2 m/m, —saving utilities and providing low cost incremental capacity to licensees of the Mobil-Badger technology. In addition, MCM-22 and the new family of the alkylation catalysts are also used as a substitute for $AlCl_3$ in EB synthesis as well as for the production of linear alkylbenzenes, an area that has traditionally employed aluminum chloride and HF catalysts.

Acknowledgement

The authors would like to thank Borealis Polymers Oy of Porvoo, Finland for use of their commercial operation data.

Reference

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《解 説》

ゼオライト合成に用いる有機Structure-directing Agentに関する研究

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嵩高い分子の疎水的反応場として適している大孔径高シリカゼオライトの合成には，有機structure-directing agent（SDA）が多用される。SDAの構造と有効性の相関には未だ不明な点が多く，これを明らかにすることがゼオライト合成化学の発展のために重要である。本稿では，SDAを用いたゼオライト合成の現状を紹介するとともに，SDAとして機能するために求められる有機物の物性（分子の親／疎水性，サイズ，形，電荷分布，化学的安定性等）について概説する。特に，従来注意が払われてこなかったSDAの化学的挙動についての知見は，新しいSDAの設計指針を与える重要なファクターである。

1. はじめに

ゼオライトの特徴は結晶性（主としてシリケート）であることとマイクロ孔（直径0.3-2.0nmの細孔）を持つことである[1,2]。これは、ゼオライトが厳密かつ均一に制御されたサイズ・規則性をもつナノメーター領域の微空間を有することを意味する。後述するように，ゼオライトのもつ空間は構造制御された有機のstructure-directing agent（SDA; 構造指向剤，構造規制剤[3]，構造調節剤[4]，構造誘導剤[5]，構造決定剤[6]，結晶化促進剤等様々な訳語があてられている）を用いることによって効果的に構築される[1]。実際には包接された有機SDAの除去によってはじめて空孔が得られる。

最初の非天然型ゼオライトの合成（1948年）[7]および有機物を用いるゼオライト合成（1961年）[8]以来，ゼオライトの合成化学は発展し続けている。現在，有機SDAは生成ゼオライト相の決定要因の一つと考えられており，近年では有機SDAの複雑な分子設計が新しいゼオライトの創製につながる例も増えている。したがって有機SDAの性質や化学的挙動を理解することの重要性はますます増大している。有機物と生成ゼオライトの相関については優れた総説[1,9-12]が出ている。本稿ではそれらの内容もふまえつつ，比較的嵩高い有機物を用いた大孔径高シリカゼオライトの合成に焦点を絞り，特に従来あまり注目されてこなかった有機SDAの化学的性質や挙動についての知見を紹介したい。なお，高シリカゼオライト合成に用いられるSDAとしては有機カチオンである四級アンモニウム化合物が最も例が多く，合成時のpHによってはアミン類も用いられる。特殊な例としてはUTD-1[13]の合成に用いられる有機金属錯体がある。カチオン性有機化合物の場合は，無機カチオンの有機版と考えるとその働きが理解しやすい。本稿では，一部の例外を除いて四級アンモニウム系のSDAのみを扱うことにする。

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2. 高シリカゼオライト合成における有機カチオンの役割

四級アンモニウム化合物に代表される有機カチオンが重要な働きをするのは，特に疎水性である高シリカゼオライトの水熱合成においてである。有機カチオンは高シリカゼオライトの無機骨格と非共有結合的な弱い相互作用をし，結果的にゼオライトの生成過程に非常に大きな影響を及ぼす[14]。一方，無機成分の働きが重要なのはいうまでもなく，無機・有機両成分の効果で生成結晶の相が決まる。有機カチ

オンが何らかの役割を演じてゼオライトが生成したとき，その有機カチオンは生成物の細孔中に包接され，これは生成物の化学分析や熱分析，NMR等で確かめられる。有機カチオンを包接したゼオライト（ホストーゲスト複合体）はホスト，ゲスト単独の場合より熱力学的に安定であることが知られている[15]。有機カチオンが構造中に含まれると通常高シリカゼオライトになるが，これは有機カチオンが無機カチオンに比べて大きいため空孔を広く占有するからである。有機分子が空孔内を占有すると無機カチオンの入りうる余地が減少し，その減少した無機カチオンの数に相当するAlサイトの数も減少して高シリカ組成となる[16]。

この様な有機カチオンはテンプレートと呼ばれてきた。しかしながら，厳密な意味でのテンプレート効果は事実上まだ知られていない。あるものは単にゼオライトの細孔構造を安定化するだけと考えられ，この場合，同一の有機物を用いても出発ゲル組成の選び方によって何種類ものゼオライトが生成する。この様な有機物は“pore-filler”の性質を持つと考えられる[10]。また，例えばZSM-5やZSM-48の合成には十数種以上の異なる有機物が用いられ，このケースにおいても有機物がpore-fillerとして働いているという見方もある[1]。出発ゲル組成よりも主に有機物が特定の生成ゼオライト相への方向づけを行う場合，これを“structure-direction”と言うことができる。structure-directionの典型例は，① 18-crown-6を用いるhexagonal faujasite（EMT）の合成[17-20]，② trimethylmyrtanylammoniumを用いるCIT-1(CON）の合成[21]等である。このように生成ゼオライトの構造を（ポリタイプも含め）厳密にコントロールできる有機物が理想的なSDAである。しかし，pore-fillerとSDAの厳密な境界線はなく，合成に有効な有機物を一般にSDAと呼ぶことが多い。

真のテンプレートに近い例として，ZSM-18（MEI）の合成における4環性のトリスアンモニウムカチオン**1**が挙げられる[1,22]。ゼオライトの系では通常，有機分子の「回転体積」に対応するホスト骨格が形成され，包接された有機分子（ゲスト）はその中で「回転」していると考えられている。ところが**1**は限定されたジオメトリーでのみMEIの細孔中に包接され，回転も完全に制限されていることがエネルギー計算や分子モデリングより推察される（図1）[1]。

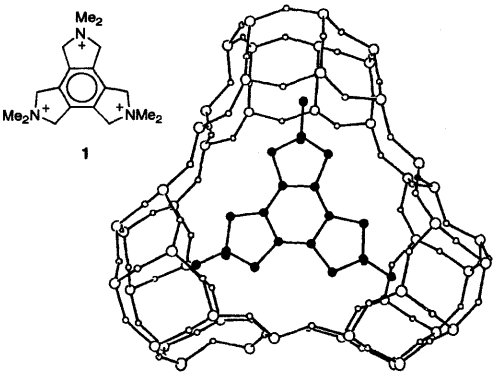

図1　ZSM-18細孔内におけるSDA**1**の推定位置[1]

このように，ゲストが自由回転できないほどホストーゲスト相互作用が強い系ではゲス分子自身の（回転体積でない）ジオメトリーが認識され，真のテンプレート効果が生じるとLoboらは考えている[1]。つまりstructure-directionのうちホストーゲスト相互作用が非常に強いものが「テンプレート効果」であると言える。しかし両者の間に厳密な境界線を引くことは難しい。

3. SDAとして機能するための有機物の物性

ゼオライトの生成に重要な働きをする有機カチオンを以後すべてSDAと呼ぶことにする。大孔径高シリカゼオライト合成のSDAとして機能するために重要な有機物の物性として ① 疎水性，② 分子のサイズ，③ 分子の形，④ 分子内の電荷分布，⑤ 水熱合成条件下での化学的安定性等の因子が考えられる。以下，それぞれの因子について説明する。

3.1　疎水性

水中に存在する有機カチオンは自分自身のまわりに水分子を配列させ，構造水を作る。一方水中のシリケート種のまわりにも構造水が作られる。有機カチオン種とシリケート種はそれぞれ「疎水的な水和」を受けている。両疎水成分の近接とともに表面の構造水が一部自由となり，自由エネルギー的に安定化する。結果としてシリケート種が有機カチオン種を取り囲む形となり，複合体を形成する。言い換えると，有機カチオン種とシリケート種は水中で疎水的相互作用をすると考えられる。この複合体が核形成や結晶成長の鍵となると考えられている

(図2)[23-26]。

有機カチオンの親水性が強すぎると，水素結合を介して強く水和されてしまい，シリカとの相互作用が生じない。逆に疎水性が強すぎると有機カチオン同士が疎水結合によって無秩序に凝集してしまい，規則的な無機構造の生成が困難となる。したがって有機カチオンがSDAとして機能するには適度な疎水性を持たなければならない。

以上のことから有機物としては強い水素結合能を持つ官能基を含む有機物はSDAとして不適切と考えられる。四級アンモニウム部分以外は炭化水素のみの分子が最も適している。このとき分子のC/N^+値が疎水性／親水性の指標となり，$8 < C/N^+ < 17$がSDAとして望ましいことが報告されている。

図3は各種のquaternary ammonium iodideが水層と有機層にどのように分配するかを示したものである。横軸はアンモニウム塩のC/N^+比，縦軸は水層から有機層への移動度Tr（有機層への分配率）である。TMAI, TEAI, TPAI, TBAI, TPenAI等の単純なテトラアルキルアンモニウム塩であっても，**2**, **3**, **4**, **6**, **9**, **10**等に代表される合成アンモニウム塩であってもプロットは同様のシグモイド型カーブを与えることを筆者らは報告している[14]。したがって，官能基を含まないアンモニウム塩の疎水性はC/N^+比で普遍的に見積もることができると考えられる。図3のカーブの立ち上がりは$C/N^+ = 12$付近で始まっており，ここを中心とする領域（I）に相当するSDAは種々の新規高シリカゼオライトを生み出してきた[10,12]。やや疎水性よりの領域（II）に相当するSDAも場合によっては有効で，実際これらを用いて有望な高シリカゼオライトが合成されている[27,28]。ただし合成は比較的高い温度で行われており，これ

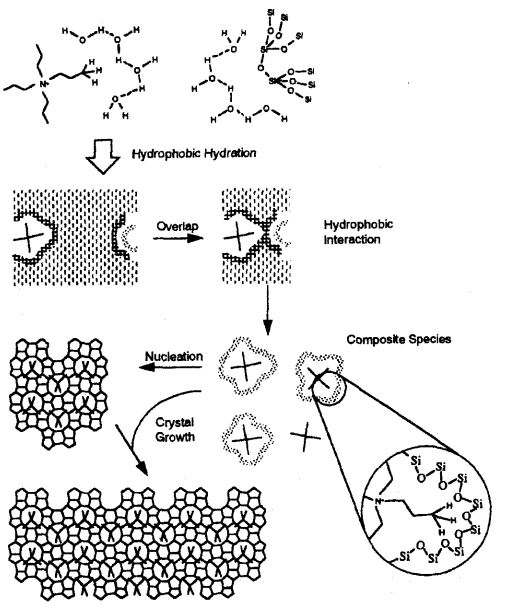

図2 SDA（ここではTPA$^+$）とシリケートの水中での相互作用[25]

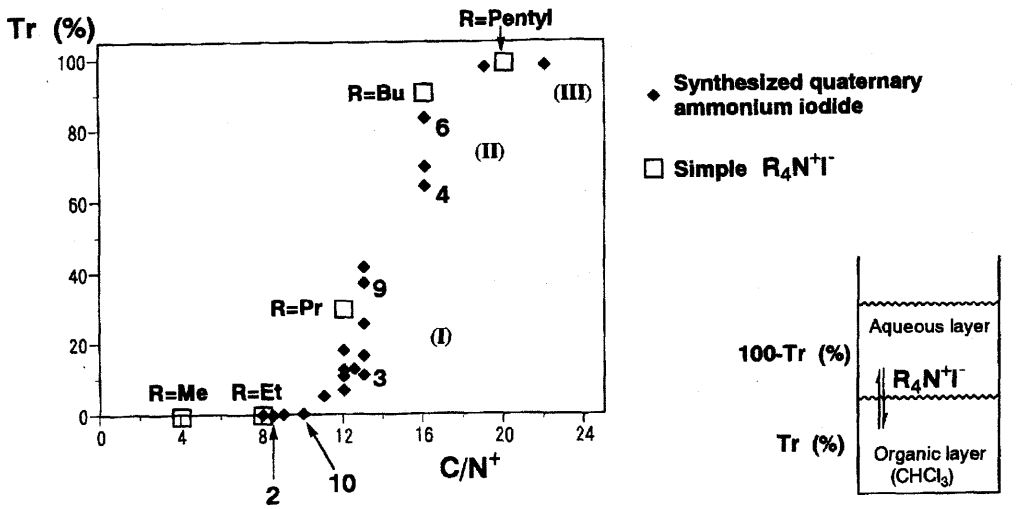

図3 各種四級アンモニウムアイオダイドのC/N^+比と水層から有機層への相関移動度（Tr）の関係

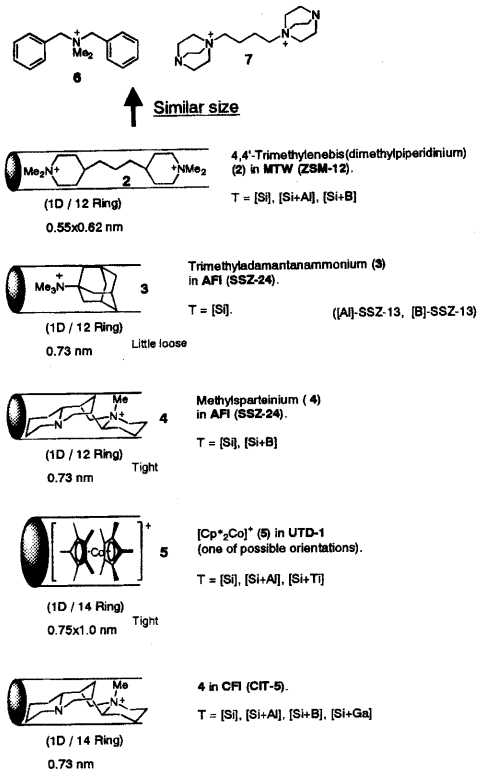

図4 嵩高いSDAの一次元細孔へのfitting

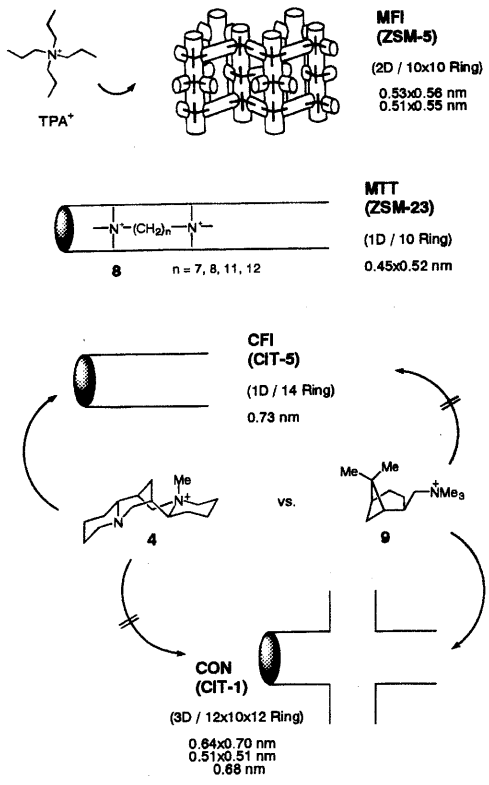

図5 SDA分子の形と生成する細孔構造

は高温でSDA同士の凝集が抑えられるためとも考えられる。領域（III）に相当する有機カチオンはもはや結晶性生成物を与えない。疎水性が高すぎるためと考えられる。

3.2 分子のサイズ

図4にいくつかの1次元細孔を有する高シリカゼオライトと，合成に用いられるシリンダー型のSDAを示す。SDAのサイズに対応した細孔が形成されている。fittingがややゆるい場合，pore-filler的な性質が現れて合成条件に依存して異なるゼオライトが生成する傾向が強まる。

3.3 分子の形

大まかに分類すると，直鎖状またはシリンダー状の分子は一次元の細孔を作りやすく，枝分かれした分子または屈曲した分子は多次元の細孔を作る傾向がある（図5）[11,14,29]。直鎖状分子**8**を用いると，10員環のストレートチャンネルをもつZSM-23（MTT）が生成する。直鎖アルキル基と10員環のサイズが対応していると考えられる。一方，枝分かれ構造を有するTPA+は多次元の細孔を持つMFIの合成における強力なSDAである。直線型および屈曲型conformationのいずれをもとりうる分子**6**，**7**を用いると，全シリカの条件では12員環のストレートチャンネルをもつZSM-12（MTW）が生成するが，出発ゲル中にAlやB等のヘテロ（non-silicon）元素を共存させておくと，それらの元素がT原子として骨格中に組み込まれるとともに多次元の細孔をもつBeta（BEA）が生成する。この傾向はT原子の種類によりT-O-T角が異なることにも起因すると考えられている[11]。

3.4 分子内の電荷分布

大孔径のゼオライトを合成するには嵩高いSDAを用いるのが最も有望なアプローチであるが，炭素数の増加とともにC/N+比の極端な増大を防ぐためにN+を導入する必要がある。図6の二価カチオン

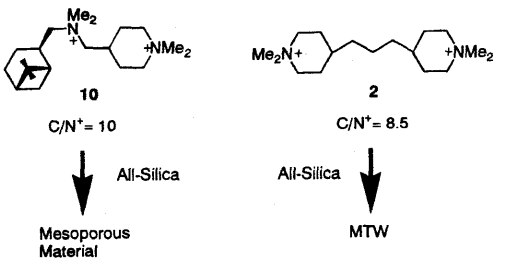

図6 SDAの分子内電荷分布と生成するモレキュラー・シーブの相関

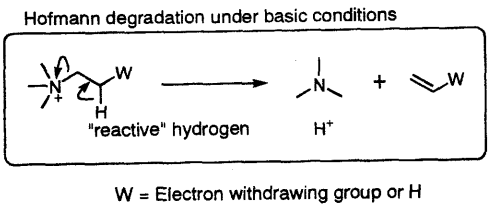

図7 塩基性条件下における四級アンモニウム化合物のHofmann分解の機構

10はN+が2ヶ所あるためにC/N+＝10であり，ゼオライトのSDAとして適度な疎水性が期待される。しかし実際には，**10**はメソポーラス物質を与える。これは極端な電荷の偏りにより界面活性剤として働くためと考えられる[30]。一方，電荷が対称的に分布している二価カチオン**2**を用いる合成ではMTWが生成する。

3.5 水熱合成条件下での化学的安定性

水熱合成条件は通常pH≧10で100～200℃なので，四級アンモニウム系のSDAはHofmann分解反応（β脱離の一種）をおこしやすい。特にアンモニウムのβ位に酸性度の高い水素がある場合，容易にHofmann分解が起こる（図7）。したがってエチレンジアミン誘導体はSDAとして適さない。また，エチルアンモニウム類もHofmann分解してエチレンを放出しやすい。この場合，水熱合成容器の内圧が上がるので注意が必要である。しかし，SDAが一部分解してもゼオライトの結晶化が非常に速ければ問題ない。事実，テトラエチルアンモニウム（TEA^+）に代表されるトリエチルアミン誘導体は，比較的分解しやすい分子であるにもかかわらずSDAとして広く

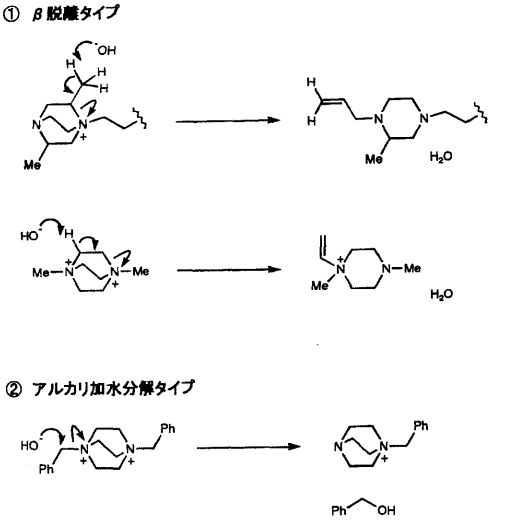

図8 水熱合成条件下でのSDA分解反応のタイプ

用いられている。また，分解しやすいエチレンジアミン構造を含む有機物を用いた場合，分解生成物がSDAとして働くことがある[31]。最近我々は分解過程を追跡し，分解生成物によるstructure-directionを実際に観測した。さらに，有機化学的考察から予測される化学変化が実際のゼオライト合成中またはゼオライト合成条件に近い塩基性条件下で起こることを見いだした。反応のタイプとしてはいずれも，①β脱離タイプ，② アルカリ加水分解タイプに分類できた（図8）。

4. まとめ

近年は，嵩高いSDAに関する知見が増えており，その一部は3.2および3.3に示してある。今後ますます重要性を増すと予想される合成の基本的なコンセプトも発表されている[32]。出発ゲル中の金属カチオンの種類と濃度もまた合成の重要な要素となっている。純粋にSDAの作用を議論するには全シリカ組成でかつアルカリ金属イオンを含まない系が適しているであろう[33]。ただしこの場合，as-synthesizedサンプルにおけるdefect siteの考察が重要となる[34]。その点，fluoride mediaでのアルカリ金属を含まない合成法[35]は，有機SDAの効果を最大限に発揮させ，しかもdefectの非常に少ない生成物を与える優れた方法であると考えられる。しかしながらこの方法でも，水の量が決定的な影響を及ぼすケースが知

られている[36]。結局は，結晶化直前のシリケートオリゴマーの性質がその後の運命に大きく関わっているように思われる。今後，シリケート種の状態に関する研究が非常に重要であると考えられる。

一方，ゼオライト合成中の有機SDAの化学的挙動（化学変化を含む）について本稿でごく一例を示したが，全体としてこれらの知見がまだ不足している。シリケート種の化学とともに有機SDAの化学に関する研究を進めることにより，究極の夢である“zeolite synthesis by design”に少しでも近づきたいものである。

追　記

Zonesらはrigidityを重視した分子設計を行い，数多くの新規ゼオライトを生み出している。彼らの最新の知見をごく最近の発表に見ることができる[37]。

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Study of Organic Structure-directing Agent (SDA) for Zeolite Synthesis

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The use of organic structure-directing agent (SDA) is a potential tool to obtain high-silica molecular sieves (including zeolites). With respect to the contribution of the organic SDAs, it is important to understand the properties of these molecules that influence the resulting zeolite phase. Such information allows for improvements in efforts to generate zeolite structures "by design". In this article, various characters of organic SDAs (mainly quaternary ammonium compounds) are correlated to the ability for structure-direction in zeolite synthesis. The following factors of SDA molecule are taken into consideration: hydrophobicity, size, shape, charge distribution, and chemical stability. Appropriate hydrophobicity of SDA molecule is particularly important in terms of organic-silicate interaction. It is also important to consider the chemical stability of SDA molecule to design new SDA structures. The chemical decomposition pathways of SDA molecules under basic conditions are carefully investigated; the Hofmann degradation and alkaline hydrolysis are actually observed in some cases.

Keywords: Structure-directing agent, Molecular sieve, Zeolite, Hydrophobicity, Chemical stability

平成11・12年度理事会および総会

ゼオライト学会の平成11・12年度新旧合同理事会，総会，講演会および懇親会が，平成12年1月20日に学士会館本館にて開催された。

平成11・12年度新旧合同理事会

平成11年度理事，平成12年度理事候補者の合同理事会が開催され，以下の議事が審議された。

1. 平成11年度事業報告
   辰巳企画委員長（平成11年度）より別掲の事業報告があり，承認された。
2. 平成11年度決算
   丹羽庶務理事より別掲の本会および国際交流基金の決算と監査結果について報告があり，承認された。
3. 平成12年度役員候補者
   役員推薦委員会の報告に基づき，別掲の平成12年度役員候補者および各担当予定を承認し，総会にはかることとした。
4. 平成12年度事業計画
   辰巳企画理事より別掲の事業について提案があり，これを承認した。
5. 平成12年度予算
   丹羽庶務理事より別掲の本会および国際交流基金の予算について説明があり，これを承認した。
6. その他
   丹羽庶務理事より会員の入退会状況および財務状況の推移について説明があった。特に法人会員の減少について話題となり，今後の積極的な会員勧誘と学会活動の活性化の要望が出された。

平成11年度総会

平成11年度事業報告

1. 講演会，講習会，シンポジウムなど

(1) 総会講演会　平成11年1月26日　於東京ガーデンパレス。
Jean-Alain Dalmon (CNRS/IRC) "Some recent results in zeolite membrane research in Europe"
稲垣伸二（豊田中研）「メソポーラスマテリアルのミクロ構造制御による機能化」

(2) 講習会「ゼオライトと吸着現象」平成11年5月28日　於海老江西コミュニティーセンターならびに日本ベル(株)。世話人：辰巳　敬（横浜国大）　参加者 22名

(3) 第7回ゼオライト夏の学校　平成11年6月24日～26日　於東京ガス(株) 蓼科山荘。世話人：片田直伸（鳥取大），里川重夫(東ガス)　参加者 46名

(4) ゼオライトフォーラム「最近の環境問題と対策」平成11年11月12日　於龍谷大瀬田キャンパス。世話人：後藤義昭（龍谷大），松永 斉（奥多摩工業）　参加者 80名

(5) ゼオライト研究発表会　平成11年10月21日～22日　於北見市民会館。世話人：高橋信夫（北見工大），松田 剛（北見工大）他。特別講演　van Bekkum（1998 IZA Award），八嶋建明　参加者 145名

平成11年度決算

収　入（単位　円）	予算	実績	差引
法人会員会費	4,800,000	4,549,265	250,735
個人会員会費	1,062,000	990,000	72,000
学生会員会費	19,000	14,000	5,000
預金利息	3,000	2,918	82
雑収入	100,000	24,180	75,820
前年度繰越金	1,060,275	1,060,275	0
合　計	7,044,275	6,640,638	403,637

支　出（単位　円）	予算	実績	差引
ニュースレター編集発行費	2,600,000	2,519,908	80,092
総会開催費	450,000	435,570	14,430
講演会研究会等			

経費	950,000	576,771	373,229
事務局経費	600,000	604,628	△4,628
交通通信費	600,000	465,840	134,160
理事会経費	400,000	344,826	55,174
編集委員会経費	100,000	100,000	0
企画委員会経費	100,000	73,680	26,320
国際交流基金	500,000	500,000	0
名簿作成費	500,000	279,724	220,276
予備費	244,275	0	244,275
合　計	7,044,275	5,900,947	1,143,328
次年度繰越金		739,691	

差引は予算から実績を引いたもの。

平成11年度国際交流基金決算

収　入（単位　円）

前年度繰越金	17,544,029
ゼオライト学会から	500,000
預金利息等	29,941
合　計	18,073,970

支　出（単位　円）

van Bekkum先生旅費補助	385,730
ZMPC2000事務局へ	1,000,000
（東北大・宮本先生へ）	
通信費	1,470
次年度繰越金	16,686,770
合　計	18,073,970

平成12年度役員

（敬称略）

会　長　菊地　英一（早大理工）
副会長　瀬川　幸一（上智大理工）（企画）
　　佐藤　　洋（住友化学）*（企画）
理　事　堂免　一成（東工大資源）（企画委員長）
　　山崎　淳司（早大理工）（編集委員長）
　　馬場　俊秀（東工大院工）（庶務）
　　大久保達也（東大院工）（企画）
　　増田　隆夫（京大院工）（企画）
　　久保　百司（東北大院工）（企画）
　　清住　嘉道（物質研）（企画）
　　岡崎　　肇（日石三菱）（財務）
　　辻　　勝行（昭和電工）（企画）
　　松本　　浩（新東北化学）（企画）
　　阿部　　潔（水澤化学）*（庶務）
　　石田　　浩（旭化成）*（企画）
　　川勝　　健（触媒化成）*（編集）
　　鈴木　貞勝（東燃化学）*（財務）
　　瀬戸山　亨（三菱化学）*（財務）
　　高橋　信夫（北見工大）*（企画）
　　辰巳　　敬（横浜国大工）*（企画）
　　谷口　政碩（地質調査所）*（企画）
　　丹羽　　幹（鳥取大工）*（庶務）
　　三田　宗雄（日本化学）*（財務）
監　事　中村　宗和（千代田化工）*
　　八嶋　建明（東工大院工）

◎ただし*印（平成12年度），無印（平成12・13年度）

平成12年度事業計画

1. 講演会，講習会，シンポジウムなど

(1) 総会講演会　平成12年1月20日　学士会館。
新　重光（クボタ）「ゼオライトの合成と機能」
溝田忠人（山口大工）「ゼオライト水の水和熱と状態について－ゼオライトの熱交換材への応用を目指して」

(2) 講習会「固体NMR」
時期・場所は未定。世話人：中田真一（秋田大）

(3) 第8回ゼオライト夏の学校
期間：平成12年6月29日～7月1日，場所：於旭化成鳥羽保養所，世話人：佐野庸治（北陸先端大），角田　隆（旭化成），定員40名

(4) ゼオライトフォーラム
テーマ：ゼオライトの明日を開く，期間：平成12年6月16日，場所：於工学院大学新宿校舎，世話人：難波征太郎（帝京科大），五十嵐　哲（工学院大），小松隆之（東工大）
約9件の若手研究者による招待講演を予定。

(5) ゼオライト研究発表会
期間：平成12年11月21日～22日，場所：於早稲田大学国際会議場，世話人：松方正彦（早大），大久保達也（東大）他

(6) ZMPC2000

平成12年8月6日～9日，場所：於仙台国際会議場，組織委員長：宮本　明（東北大），寺崎　治（東北大）

平成12年度予算

収　入（単位　円）	
法人会員会費	4,500,000
個人会員会費	990,000
学生会員会費	14,000
預金利息	3,000
雑収入	25,000
前年度繰越金	739,691
合　計	6,271,691
支　出（単位　円）	
ニュースレター編集発行費	2,600,000
総会開催費	450,000
講演会研究会等経費	800,000
事務局経費	600,000
交通通信費	500,000
理事会経費	400,000
編集委員会経費	100,000
企画委員会経費	100,000
国際交流基金	500,000
予備費	221,691
合　計	6,271,691

平成12年度国際交流基金予算

収　入（単位　円）	
前年度繰越金	16,686,770
ゼオライト学会から	500,000
預金利息等	30,000
合　計	17,216,770
支　出（単位　円）	
ZMPC2000事務局へ	1,500,000
次年度繰越金	15,716,770
合　計	17,216,770

ゼオライト学会会則

(1984年1月11日制定，1998年4月1日改訂)

(名称)

第1条　本会は，ゼオライト学会（英文名：Japan Associationof Zeolite，略称JAZ）という。

(目的)

第2条　本会は，天然および合成ゼオライト（ゼオライト類似の結晶性鉱物，モレキュラーシーブ等を含む）に関する基礎研究および利用技術の一層の発展を図るため，その研究開発に携わるものが一堂に集まり，情報や意見の交換を通じて相互に交流する機会を作ることを目的とする。

(事業)

第3条　本会は，前条の目的を達成するため，次の事業を行なう。

(1) 研究発表会，講演会，国際シンポジウム，見学会等の開催

(2) ニュースレターの発行

(3) 本分野に関する国内外の学協会との交流

(役員)

第4条　本会に，役員として会長，副会長 2名，理事若干名および監事 2名を置く。

2. 役員の任期は2年とする。ただし，再任を妨げない。

(総会)

第5条　総会は少なくとも年1回これを開催し，事業報告，決算，事業計画，予算，会則の変更等重要事項を決定するとともに，役員の選任を行なう。

(役員の選任および職務)

第6条　役員は，理事会が委嘱した推薦委員会の推薦に基づき，総会において選任するものとする

2. 会長は，本会を代表し，会の運営に当たる。

3. 副会長は，会長の職務を補佐，代行する。

4. 理事は，会長を補佐し，本会の運営（企画，庶務，財務，編集など）を分掌する.

5. 監事は，本会の財産の状況を監査する。

(理事会)

第7条　本会に理事会を置く。理事会は，会長，副会長および理事をもって構成する。

2. 会長は，必要と認めた場合，理事会を開催することができる。

3. 理事会は，本会の運営に関する大綱を検討し，その結果を総会に提案するものとする。

(委員会)

第8条　本会に企画委員会を置く。

2. 企画委員会は，本会事業の企画および運営を担当する。

3. 企画委員会の組織および運営については別に定める。

4. 委員の任期は2年とする。ただし，再任を妨げない。

第9条　本会に編集委員会を置く。

2. 編集委員会は，ニュースレターの編集および刊行を担当する。

3. 編集委員会の組織および運営については別に定める。

4. 委員の任期は2年とする。ただし，再任を妨げない。

(会員)

第10条 会員は，本会の趣旨に賛同する個人および法人とする。

個人会員は，氏名および所属を本会に登録する。

法人会員は，代表会員の氏名および所属を1名以上5名以内で本会に登録する。

名誉会員は，ゼオライトの基礎研究，利用技術または本会の発展に特に功績があり，理事会において承認された者とする。

(会計)

第11条 本会の経費は，会員が拠出する会費によって支弁するものとする。

年会費　1. 個人会員

一般	年額	3,000円
(学生)	年額	1,000円

2. 法人会員　年額　1口　100,000円

2. 本会の事業年度は，毎年1月1日に始まり，12月31日に終わる。

(事務局)

第12条 本会の事務局の所在地は下記のとおりとする。

〒680-0945　鳥取県鳥取市湖山町南4-101
鳥取大学工学部物質工学科 丹羽研究室 内
電話 & Fax: 0857-31-5256
E-mail: zeo@chem.tottori-u.ac.jp

この会則は，昭和59年1月11日より施行する。

改訂　昭和63年1月20日

改訂　平成 2年1月18日

改訂　平成 9年1月24日

改訂　平成10年4月1日

《 レポート 》

第15回ゼオライト研究発表会報告

北見工業大学　高橋信夫

第15回ゼオライト研究発表会が平成11年10月21日（木），22日（金）の2日間，北見市民会館で開催されました。ゼオライト研究発表会は東京と地方での交互開催が慣例となっており，これまでは第7回の鹿児島から第13回の長崎まで，中四九州地区での地方開催が続いておりました。今回，一気に北上し日本北端地の北見で開催しました。研究発表会は例年11月下旬に開催されますが，北見では寒すぎるとのことで10月の開催となりました。このため，講演申込，プログラム編成，ニュースレターの原稿作成等の作業が例年になくあわただしくなり，関係各位には大変御努力頂きました。この場を借りて感謝申し上げます。

今回の参加登録者数は140名（うち正会員 90名，学生 47名，非会員 3名）と前回よりも減少しました。これは9月末から日本化学会（札幌），触媒学会（秋田）と遠方の地での学会が間隔をおかずに行われたためではないかと思っています。しかし，約120名が北海道外からの参加者でした。講演件数は71件と前回とほぼ同数で，内訳は特別講演 2件，総合講演 4件，一般講演 65件でした。特別講演は次の二人の先生にお願いしました。

1) Zeolites and related materials as versatile catalysts in organic conversions, Delft University of Technology, Professor H. van Bekkum
2) ゼオライト触媒の修飾法ーいろいろやってみたことー，東京工業大学　八嶋建明教授

両先生の講演は長年のゼオライト関連の研究成果と豊富な知見に基づいた内容で，会場も熱気に包まれ活発な質議応答がなされました。両先生のゼオライト研究に対する情熱が感じらる講演でありました。総合・一般講演では，この数年来の傾向と同様にミクロおよびメソポーラスマテリアルの合成やキャラクタリゼーションに関する内容が数多く報告されました。Bekkum先生も2日間日本語の講演を熱心にお聞きになり，そして活発に質問され，発表会を活気あふれるものにして下さいました。

第1日目の講演会終了後，約80名の参加者を得てオホーツクビールで懇親会が行われました。席上，ゼオライト学会会長八嶋建明先生のご挨拶，Bekkum先生のお話，そして辰巳企画委員長（横浜国立大学）の乾杯で懇親会が始まり，終始和気あい

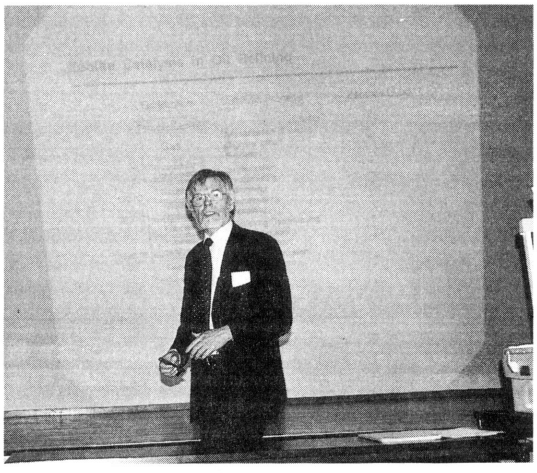

写真1　Bekkum教授による特別講演

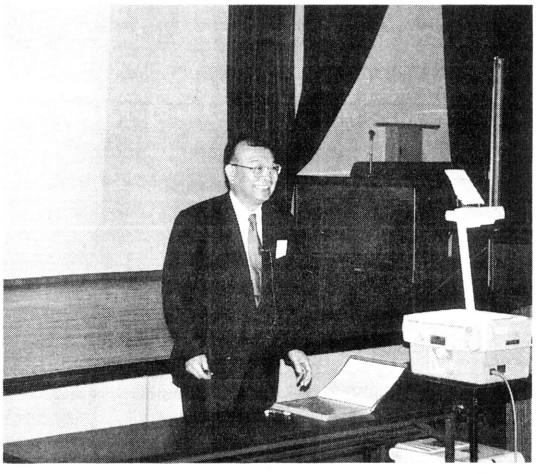

写真2　八嶋教授による特別講演

あいの雰囲気で，時の経つのも忘れる程でありました。最後に，菊地英一先生（早稲田大学）から次回の研究発表会が早稲田大学で開催されることをお聞きし，早稲田での再会を確認しました。

今回の実行委員会は，東工大の馬場先生，小松先生，早稲田大学の山崎先生，北見工大の高橋，射水，松田が務めましたが，研究発表会が大過なく成功裏に終えることができましたのは，学会事務局，企画委員会の皆様および遠く北見まで足を運んで頂いた参加者皆様のおかげであります。心から御礼申し上げます。また，今回の研究発表会実施にあたり，北海道および北見市から補助金を頂きました。深く感謝する次第です。

「ゼオライトフォーラム－最近の環境問題と対策－」報告

栃木県県南工業指導所　松本泰治

本年度のゼオライトフォーラムが11月12日に大津市の龍谷大学RECホールで開催されました。琵琶湖を抱え環境問題の先進地滋賀県に相応しく，“最近の環境問題と対策”というテーマで講演と見学会が行われました。当時は雨模様にもかかわらず，見学会には21名，講演会には一般参加者40名と龍谷大の学生さん29名の参加があり大変盛況に行われた。

午前中の見学会で訪れた琵琶湖県立博物館は，“琵琶湖”を地質，生態，歴史，人文科学などあらゆる面から取り上げ，展示のみならず調査，研究も行っているユニークな博物館であり，参加者からも1時間半の見学時間では短いとの声があった。

午後の講演会は，最初にゼオライト学会会長の東工大 八嶋建明先生からIntroductory Talkとして「ゼオライトと環境」と題し，ゼオライトのもつカチオン交換機能，吸着機能，触媒機能は環境保全に有効に利用でき，しかもゼオライト自身は無害であることから，今後ますます環境問題に対してゼオライトの果たす役割が大きくなるというお話しがありました。続いて環境問題に関して様々な切り口からの講演が4件行われました。以下，その概要を紹介いたします。

滋賀県立大の伏見碩二教授は，「琵琶湖の水資源の保全と環境課題」と題し，琵琶湖の富栄養化の解消に寄与する微生物の活動には十分な溶存酸素が必要であり，その供給源として雪どけ水が果たす役割が大きいが，近年酸性雪が汚染源となるという問題があることを指摘した。そして雪の結晶内部の酸性物質分布をX線CTを利用して測定するユニークな研究法が紹介され大変興味深いものであった。

信幸建設（株）の西川豊氏は「天然ゼオライトを主材にした水処理技術の開発」と題し，クリノプチロライト系天然ゼオライト，クリストバライト，木炭を組み合わせた浄化システムを実際に河川水に適応した，1年半に渡る実証実験について報告された。このシステムはBOD，SS，アンモニア体窒素について優れた除去能力があり，実用の可能性の高いこ

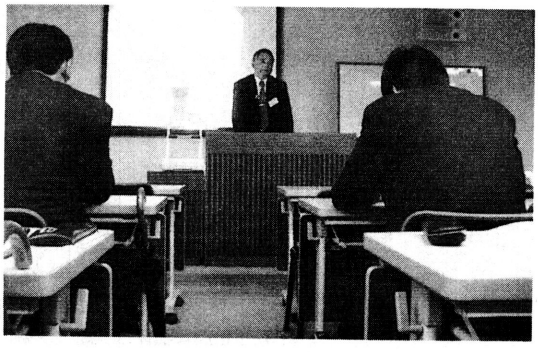

写真1　講演会の様子

写真2　懇親会の様子

とが証明され，天然ゼオライトが環境浄化に優れた材料であることを再認識させられました。

名古屋大の服部忠教授は「メソポーラスマテリアルを用いた環境ホルモンの光触媒分解」と題し，近年新たな環境汚染物質として問題視されている内分泌かく乱物質，いわゆる環境ホルモンをチタニア架橋粘土の光触媒機能による吸着，分解について報告された。フタル酸ジブチルを例にした結果ではCO_2とH_2Oへの完全な分解が可能であり，今後メソポーラスマテリアルが内分泌かく乱物質の除去に対して期待出来る材料であることが示唆された。

最後に，龍谷大の原田忠夫教授から「大学における環境教育」と題し，龍谷大物質化学科において来年度から実施されるグリーンケミストリーを基盤とした，新カリキュラムが紹介された。その中で育成すべき学生像として，物質化学の基礎知識を持ち，その知識を適切使うための倫理観を持つことが上げられ，そのためにグリーンケミストリー関連科目を基盤に据え，物質製造の立場から環境や生態系を学んでゆくためのカリキュラムが紹介された。環境を破壊するのも，保全するのも人間であることを考えると，龍谷大のこの試みは21世紀に必要とされる科学者，技術者の育成という観点から非常に重要である思われます。

今回のフォーラムはゼオライトの環境問題への貢献という観点のみならず，環境汚染の現状，環境問題に貢献する人間育成にまで踏み込んだ内容であり，我々を取り巻く環境問題の重要性を改めて感じさせられました。

講演会終了後，龍谷大RECホールにて，講師の先生方を交えて懇親会が行われました。講演会では尽くせなかったディスカッションなどで大いに盛り上がり，その後，大津の夜に二次会，三次会へと繰り出したグループもありました。

最後に，講演いただきました講師の先生方，今回のフォーラムを企画，運営いただきました龍谷大の後藤義昭教授，奥多摩工業(株) の松永斉氏に感謝申し上げます。

タイトルサービス

MICROPOROUS AND MESOPOROUS MATERIALS

Vol. 32 No. 3 **DECEMBER 1999**

MICROPOROUS AND MESOPOROUS MATERIALS

Vol. 33 Nos. 1-3 **DECEMBER 1999**

MICROPOROUS AND MESOPOROUS MATERIALS

Vol. 34 No. 1 **JANUARY 2000**

MICROPOROUS AND MESOPOROUS MATERIALS

Vol. 34 No. 2 **FEBRUARY 2000**

【写真募集】

本誌では，ご存知のように毎号，表紙裏にゼオライト等の写真を掲載してまいりました。さらにこの欄を皆様に親しまれるものとするため，会員の皆様から広く作品を募集いたしております。奮ってご応募下さいますようお願い申し上げます。フィルムの添付は不要ですが，なるべく手札サイズの大きさの写真を，簡単な説明文と共に下記宛にお送りください。

〒169-8555 東京都新宿区大久保3-4-1
早稲田大学理工学部環境資源工学科 山崎淳司

お知らせ

第16回ゼオライト研究発表会

11月に早稲田大学で開催

第16回ゼオライト研究発表会は，11月21日(火)と22日(水)の両日，東京都新宿区の早稲田大学国際会議場で開催されることになりました，詳細は次号でお知らせいたします。

ゼオライトフォーラム
― ゼオライトの明日を開く ―

本会昨年度会長でいらした東京工業大学大学院理工学研究科教授八嶋建明先生が，本年3月31日付けで退官されることになりました。これを記念し，下記の要領でゼオライトフォーラムを開催いたします。多数の方々のご参加をお待ち申し上げます。

主　催：ゼオライト学会

期　日：2000年6月16日(金)

場　所：工学院大学新宿校舎3階講義室（新宿区西新宿1-24-2，JR新宿駅西口より徒歩5分，TEL. 03-3342-1211）

プログラム：

9:30　開会

9:35～10:20　「ゼオライトを集積場として用いた新規機能性材料の創出」大久保達也（東大院工）

10:20～11:05　「ゼオライト上への分子の吸着－赤外分光法による観測－」野村淳子（東工大資源研）

11:05～11:50　「ゼオライト鉱物学と応用の新展開」山崎淳司（早大理工）

13:00～13:45　「エチレン共存下での銀イオン交換ゼオライトによるメタンの転化反応」馬場俊秀（東工大院理工）

13:45～14:30　「有機SDAを用いる大孔径高シリカゼオライトの合成」窪田好浩（岐阜大工）

14:30～15:15　「有機基を細孔壁内部に有するメソポーラス物質の合成」稲垣伸二（豊田中研）

15:30～16:15　「TEMによるミクロ・メソ多孔体の構造決定」大砂 哲（東北大金材研）

16:15～17:00　「ゼオライトのCrystal Engineeringの可能性について」松方正彦（早大理工）

講演会参加費（資料代含む）：当日申し受け致します。一般 3,000円，学生 1,000円

世話人：難波征太郎（帝京科学大学工学部），五十嵐 哲（工学院大学工学部），小松隆之（東京工業大学大学院理工学研究科）

懇親会：八嶋建明先生の退官を祝う会を兼ねて，フォーラム終了後下記のような懇親会を開催致します。退官を祝う会のみのご参加も歓迎いたします。

場所：京王プラザホテル 4階 扇の間
（新宿区西新宿2-2-1，TEL: 03-3344-0111）

時間：17:30～19:30

会費：一般 15,000円，学生 5,000円

参加申込方法：FAXあるいはe-mailにて① 氏名，② 所属，③ 連絡先（FAX番号，メールアドレスも），④ フォーラム・退官を祝う会（懇親会）参加の有無，を明記の上，6月1日（木）までに下記へお申し込み下さい。

申込先：東京工業大学大学院理工学研究科化学専攻 小松隆之，TEL. 03-5734-3532，FAX. 03-5734-2758，e-mail: komatsu@chem.titech.ac.jp

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第8回ゼオライト夏の学校

本年で第8回目となるゼオライト夏の学校を下記のように関西地区で初めて企画致しました。今回も研究の最先端でご活躍されている先生から，ゼオライトの基礎から最近の話題まで，幅広い内容でご講演頂く予定です。また，ポスターセッションも企画致しましたので，多数のご参加をお待ちしております。

主　催：ゼオライト学会

日　時：2000年6月29日(木)～7月1日(土)

場　所：旭化成健保賢島保養所（三重県志摩郡阿児町鵜方字タチメ3618-18，TEL. 05994-3-2973，FAX. 05994-3-6870）

形　式：講義およびポスター発表

講師と題目：

板橋慶治（東ソー）「ゼオライトの結晶化と微細構造」

岩崎 晃（工技院電総研）「ゼオライト結晶成長の光学的測定」

池田卓史（科技庁無機材研）「Powder diffractionで見えるゼオライトの形～電子密度・核密度分布で見る細孔内の様子～」

黒田一幸（早稲田大）「メソポーラスシリカの合成と形態制御」

金子克美（千葉大）「吸着と分子科学」

服部 忠（名古屋大）「NO選択還元におけるゼオライト細孔内の吸着支配拡散」

角田 隆（旭化成）「ゼオライト触媒による低級オレフィンの接触転化」

ポスター発表：20件程度

定　員：40名

参加費用：一般 30,000円，学生 10,000円（テキスト・宿泊・懇親会費を含む）当日会場にて徴収致します。

申込締切：4月28日（金）

申込先：氏名・年齢・性別・所属・連絡先・ポスター発表の有無（有の場合は発表タイトル）を明記の上，下記までFAXまたはe-mailでお申し込み下さい。

第8回ゼオライト夏の学校の世話人

佐野庸治（北陸先端大）TEL. 0761-51-1611, FAX. 0761-51-1625, e-mail: t-sano@jaist.ac.jp

角田 隆（旭化成）TEL. 086-458-3330, FAX. 086-458-3339, e-mail: a8211591@ut.asahi-kasei.co.jp

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2001 : A Clay Odyssey

12th International Clay Conference

July 29-August 4, 2001

Bahía Blanca, Argentina

GENERAL INFORMATION

The 12th International Clay Conference will be held at Universidad Nacional del Sur in Bahía Blanca under the auspices of the Association Internationale pour l'Étude des Argiles (AIPEA) with the participation of the International Society of Soil Science (Commission VII). The technical program will consist of general sessions and symposia covering all the topics within clay science. Field excursions before and after the Conference will give the delegates the opportunity to see local clay deposits situated in the almost untouched Argentina landscape. Exhibits, social events (including tango and the traditional food "asado") and tours throughout Argentina will give the participants an outlook of the Argentine culture. The Organizing Committee is formed mainly of research scientists from the local University and from other scientific institutions. On behalf of the Organizing Committee, I am pleased to invite you to attend the Conference and to join us in this "clay odyssey".

(Dr. Eduardo Domínguez, Chair)

LANGUAGE

The official language of the conference will be English.

SCIENTIFIC PROGRAM

Themes and Symposia

1. Clays in Geology
   Convenor: Dr. Patricia Zalba
2. Clay minerals and the Environment
   Convenor: Dr. Silvana Bertolino
3. Soil Mineralogy
   Convenor: Dr. Nilda Amiotti, Dr. M. Carmen Blanco
4. Physicochemical properties of clays
   Convenor: Dr. Cristina Volzone
5. Crystal chemistry, Structure and Synthesis
   Convenor: Dr. Silvia Acebal, Dr. Elsa Rueda
6. Poorly crystalline clays and Accesory minerals
   Convenor: Dr. Graciela Mas
7. Clays in Industry
   Convenor: Dr. Haydn H. Murray, Dr. Eduardo Dominguez
8. Methods
   Convenor: Dr. Pedro Maiza

Symposia

1. Teaching Clay Mineralogy
   Convenor: Dr. Darrell Schulze
   Local Convenor: Dr. Fernanda Cravero
2. Clay barriers and Waste management
   Convenor: Dr. Jorge Vallés
3. Clays in Hydrothermal deposits
   Convenor: Dr. Jorge Dristas
4. Clays in Ceramics
   Convenor: Dr. Michele Dondi, Dr. Eduardo Dominguez
5. Clay resources in the Mercosur
   Convenors: Ing. Juan Carlos Factorovich, Lic. Roberto Hevia

FIELD EXCURSIONS

1. Precambrian-Paleozoic clay deposits. Sierras Septentrionales
   Coordinator: Dr. Jorge Dristas, Dr. Cristina Frisicale
2. Bentonites and Kaolin deposits. Extra-Andean Patagonia
   Coordinator: Dr. Jorge Valllés
3. Kaolin deposits of Patagonia
   Coordinator: Dr. Eduardo Dominguez, Lic. Daniel Badino, Lic. Claudio Inglesias
4. Lateritic-Tropical Soils. Misiones Province
   Coordinator: Ing. Gabriel Piccolo
5. Semi-arid and humid soils of Buenos Aires Province
   Coordinator: Dr. Nilda Amiotti, Dr. M. del Carmen Blanco
6. Brasil kaolin deposits. Rio Jari, Brasil
   Coordinator: Dr. Haydn H. Murray

PROVISIONAL DEADLINES

FEBRUARY 1, 2000: Response to this circular in order to receive the second circular

JUNE 2000: Distribution of second circular, including registration and accommodation forms

OCTOBER 1, 2000: Submission of abstracts

MARCH 1, 2001: Advance conference and hotel registration

REGISTRATION AND ACCOMMODATION

Registration fees will be announced in the second circular. Accommodation will be available in several hotels.

EXHIBITS

Suitable space will be reserved for exhibitors. Please contact the Secretary-General and indicate your interest on the accompanying form.

ADDRESS FOR CORRESPONDANCE

Dr. Fernanda Cravero.
Secretary - General 12ICC
Departamento de Geología. Universidad Nacional del Sur, San Juan 670,
8000 Bahía Blanca, Argentina
TEL. 54-291-4595101 ext.3041
FAX. 54-291-4595148.
e-mail: 12ICC@criba.edu.ar
http://www.12ICC.criba.edu.ar

ZMPC 2000

INTERNATIONAL SYMPOSIUM ON ZEOLITES AND MICROPOROUS CRYSTALS

Final Circular
Program / Registration
Sendai International Center
Sendai, Japan
August 6-9, 2000
Organized by Japan Association of Zeolite

KEY DATES

April 30, 2000	Deadline for advance registration
May 31, 2000	Deadline for hotel and accompanying persons' program application
August 5, 2000	Pre-symposium at Akita University, "Catalysis and Characterization on Advanced Micro- and Meso-porous Materials"
August 6, 2000	Welcome Party at Sendai International Center
August 7, 2000	Symposium begins Manuscripts for Symposium should be submitted by this date
August 8, 2000	Symposium Dinner at Sendai Tokyu Hotel
August 10-11, 2000	Post-symposium at Rihga Royal Hotel Waseda, "State-of-the-Art Science of Micro- and Mesoporous Materials Synthesis"
February, 2001	The Proceedings will be published

Correspondence

Prof. Akira Miyamoto, Chairman, ZMPC 2000
Department of Materials Chemistry,
Graduate School of Engineering, Tohoku University,
Aoba-yama 07, Sendai 980-8579, Japan.
Phone: +81-22-217-7233 Fax: +81-22-217-7235
E-mail: zmpc2000@aki.che.tohoku.ac.jp

Web Site

http://www.zmpc2000.aki.che.tohoku.ac.jp

INTERNATIONAL SYMPOSIUM ON ZEOLITES AND MICROPOROUS CRYSTALS

The Organizing Committee cordially invites you to participate in the International Symposium on Zeolites and Microporous Crystals (ZMPC 2000). It will be held during August 6-9, 2000 in Sendai, Japan. The Japan Association of Zeolite will organize this meeting as a continuation of ZMPC'93 and '97.

Scope

The Symposium is aimed at promoting the fundamental and applied studies of zeolites, microporous and mesoporous materials, and layered compounds.

The major topics of the Symposium will be:

1. Mineralogy and Crystal Chemistry
2. Synthesis and Characterization
3. Ion Exchange and Modification
4. Adsorption, Diffusion and Permeation
5. Computational Chemistry
6. Intercalation and Crosslinking
7. Host-Guest Interactions, Quantum Size Effect
8. Catalysis
9. Other Applications

GENERAL INFORMATION

Symposium Site

The Symposium will be held in the Sendai International Center, Sendai, Japan.

Sendai International Center

Aoba-yama, Aoba-ku, Sendai 980-0856, Japan
Phone: +81-22-265-2211 Fax: +81-22-265-2485

Access from the JR Sendai Station:

City Bus

At the Bus Stop #9 in the bus pool, Nishiguchi (West entrance), take a bus for "Aoba-dai W8-3", "Miyakyo-dai W8-2", or "Narita-san W8-4". Get off the bus at "Hakubutsu-kan Kokusai-senta (International Center) mae"

Approx. 20 min./JPY 180

1 min. on foot to the Sendai International Center from the bus stop.

*Bus fare is subject to change with or without notice.

Taxi

Approx. 15 min./JPY 900 from the JR Sendai Station.

***During the symposium period, heavy traffic condition may cause some delay due to the Sendai Tanabata Festival.**

Sendai Tanabata Festibal

Sendai Tanabata Festival will be held during the ZMPC 2000 for three days beginning on August 6. It is one of the three biggest summer festivals in the Tohoku district, and annually attracts over 2 million tourists from around the world. The main streets in Sendai are decorated with elaborate decorations and streamers attached to bamboo poles. A parade is held in the three evenings on Jozenji Street. As a prologue of the festival, 12,000 fireworks are set off from the bank of Hirose River (19:30-20:45 on Saturday, August 5, Nishi Park).

Registration

Registration Fee:

	ADVANCE Due On / Before April 30, 2000	REGULAR Due On / After May 1, 2000
Active Participants	JPY 60,000	JPY 70,000
Students	JPY 20,000	JPY 30,000
Accompanying Persons	JPY 10,000	JPY 10,000

To encourage early registration, the advance registration fee will be applied for applications received on or before April 30, 2000. Student registration is limited to those currently enrolled in a recognized university degree program.

The registration fee includes:

- ***Admission to Scientific Sessions***
- **Receipt of a Book of Abstracts**
- **Receipt of Proceedings**
- **Welcome Party**
- **Symposium Dinner**
- **Lunch on August 7, 8 and 9**

*The registration fee for students and accompanying persons **does not** include Proceedings.

Registration desk during symposium

Sendai International Center
16:30-19:00 Sunday, August 6
8:00-17:00 Monday, August 7 through Wednesday, August 9

Hotel Accommodations

Limited blocks of rooms have been reserved at the following hotels from August 5 to August 9 (5 nights), for symposium

participants. If the hotel of your choice is fully booked, reservations will be made at another hotel. Sendai Tanabata Festival will be held during the ZMPC 2000. **Due to the Sendai Tanabata Festival, it is extremely difficult to make hotel reservations during the symposium period**; we would strongly recommend that you make hotel reservations through the ZMPC desk of Nippon Travel Agency. For application, please complete the Registration, Hotel & Accompanying Persons' Program Application Form and send it to Nippon Travel Agency by May 31, 2000. Please refer to the attached hotel list for details.

Code	Hotel Name
1	Hotel Metropolitan Sendai
2	Sendai Tokyu Hotel
3	Hotel JAL City Sendai
4	Sendai Washington Hotel II
5	Sendai Washington Hotel I
6	Toyoko Inn Sendai

Accompanying Persons' Program

Code A-1 Sendai-Matsushima One Day Tour
(Lunch is included)
Date: Tuesday, August 8, 2000
Fare: JPY 13,000
Visit: Site of Sendai Castle (Aoba-jo)
Zuiganji Temple, Godaido Island
Matsushima Bay Cruise

Code A-2 Akiu Folk Craft Experience Morning Tour
(Lunch is not included)
Date: Wednesday, August 9, 2000
Fare: JPY 8,000
Visit: Akiu Folk Craft Center
(Enjoy painting a Kokeshi Doll)

*Accompanying Persons' Program is subject to cancellation with less than 20 participants.

Key Dates for Application Form

April 30, 2000 Deadline for advance registration
May 31, 2000 Deadline for hotel and accompanying persons' program application

***Hotel and accompanying persons' program application may not be accepted after June 1, 2000.**

Application

Please use the Application Form in this circular to register for the symposium, arrange hotel accommodations, arrange accompanying persons' program, and provide information on your method of payment. The Application Form can be downloaded from the ZMPC 2000 Web Site (http://www.zmpc2000.aki.che.tohoku.ac.jp).

Payment

Please choose one of two methods of payment and sign the Application Form. All payments must be made in Japanese Yen.

Credit Card:

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Bank Transfer in Yen to:

Tokai Bank Ltd., Shimbashi Branch
Account Number: 1053199
Account Name: Nippon Travel Agency

Please send a copy of the bank transfer record to Nippon Travel Agency after payment is completed.

When you pay by credit card, the total cost for registration, hotel and accompanying persons' program will be charged to your credit card. If your payment has not been received by Nippon Travel Agency until the specified date, reservations will be automatically cancelled.

Confirmation of Registration

Upon receipt of the Application Form by mail or fax, a confirmation & invoice notice for registration, hotel accommodations and accompanying persons' program will be sent by mail or fax. Please bring the confirmation notice with you to the symposium.

Cancellations and Refunds

After you have received confirmation for registration, hotel accommodations, and accompanying persons' program, cancellation is subject to the following charges. Bank charges will be deducted from any refund.

1. Cancellation Charge for Symposium Registration
   - By May 31, 2000: No charge
   - From June 1 through June 30, 2000: 30% of registration fee
   - July 1, 2000 and after: 100% of registration fee
2. Cancellation Charge for Hotel Accommodations
   - Up to 4 days prior to the first night stay: No charge
   - 3 days to 1 day prior to the first night stay: 20% of daily room charge
   - On the arrival day or no show: 100% of daily room charge
3. Cancellation Charge for Accompanying Persons' Program
   - Up to 4 days prior to the tour date: No charge
   - 3 days to 1 day prior to the tour date: 20% of tour fare
   - After the tour commences or failure to show without notice: 100% of tour fare

Official Travel Agency

Nippon Travel Agency Co., Ltd. (NTA) has been appointed as the official travel agency for the symposium. All symposium registrations must be made through NTA. Hotel reservations and other travel arrangements are also available through NTA at special rates.

Travel Information Desk

During the symposium, a Travel Information Desk will be located at the symposium site to provide information on tours and travel options. NTA will handle all necessary travel arrangements including hotel reservations, tours and local transportation for participants.

SOCIAL EVENTS

Welcome Party

at Sendai International Center
17:30 - 19:00 on Sunday, August 6, 2000.

Symposium Dinner

at Sendai Tokyu Hotel
19:30 - 21:30 on Tuesday, August 8, 2000.

PRE-SYMPOSIUM

"Catalysis and Characterization on Advanced Micro- and Meso-porous Materials", August 5, 2000 at Cooperative Research Center, Akita University, Akita-city, Japan.

Correspondence: Prof. S. Nakata, Akita University
Phone & Fax: +81-18-889-2437, E-mail: snakata@ipc.akita-u.ac.jp

POST-SYMPOSIUM

"State-of-the-Art Science of Micro- and Mesoporous Materials Synthesis", August 10-11, 2000 at Rihga Royal Hotel Waseda, Shinjyuku, Tokyo, Japan.

Correspondence: Prof. M. Matsukata, Waseda University

Phone & Fax: +81-3-5286-3850, E-mail: mmatsu@mn.waseda.ac.jp

PROGRAM OVERVIEW

PL: Plenary Lectures (45 min. for presentation and 5 min. for discussion) at Room A.

LA, LB and LC: Invited Lectures (20 min. for presentation and 5 min. for discussion) at Room A, B and C.

A, B and C: Oral Presentations (20 min. for presentation and 5 min. for discussion) at Room A, B and C.

P: Poster Presentations.

Aug. 6 (Sun)

16:30~19:00	Registration		
17:30~19:00	Welcome Party		

Aug. 7 (Mon)

8:00~	Registration		
9:00~ 9:20	Opening Ceremony (Room A)		
9:20~10:10	1-PL-01 (Room A)		
10:10~10:20	Break		
10:20~10:45	1-LA-01	1-LB-01	1-C-01
10:45~11:10	1-A-02	1-B-02	1-C-02
11:10~11:35	1-A-03	1-B-03	1-C-03
11:35~12:00	1-A-04	1-B-04	1-C-04
12:00~13:30	Lunch		
13:30~14:20	1-PL-02 (Room A)		
14:20~14:30	Break		
14:30~14:55	1-LA-05	1-LB-05	1-LC-05
14:55~15:20	1-A-06	1-B-06	1-C-06
15:20~15:45	1-A-07	1-B-07	1-C-07
15:45~16:00	Coffee Break		
16:00~16:25	1-LA-08	1-LB-08	1-C-08
16:25~16:50	1-A-09	1-B-09	1-C-09
16:50~17:15	1-A-10	1-B-10	1-C-10
17:15~19:15	Poster Session		

Aug. 8 (Tue)

8:00~	Registration		
8:40~ 9:30	2-PL-01 (Room A)		
9:30~ 9:40	Break		
9:40~10:05	2-A-01	2-LB-01	2-LC-01
10:05~10:30	2-A-02	2-B-02	2-C-02
10:30~10:45	Coffee Break		
10:45~11:10	2-A-03	2-LB-03	2-LC-03
11:10~11:35	2-A-04	2-B-04	2-C-04
11:35~12:00	2-LA-05	2-B-05	2-C-05
12:00~13:30	Lunch		
13:30~14:20	2-PL-02 (Room A)		
14:20~14:30	Break		
14:30~14:55	2-A-06	2-LB-06	2-C-06
14:55~15:20	2-A-07	2-B-07	2-C-07
15:20~15:45	2-A-08	2-B-08	2-C-08
15:45~16:00	Coffee Break		
16:00~16:25	2-A-09	2-LB-09	2-C-09
16:25~16:50	2-A-10	2-B-10	2-C-10
16:50~18:50	Poster Session		
18:50~19:30	Move		
19:30~21:30	Symposium Dinner (Sendai Tokyu Hotel)		

Aug. 9 (Wed)

8:00~	Registration		
8:40~ 9:30	3-PL-01 (Room A)		
9:30~ 9:40	Break		
9:40~10:05	3-A-01	3-LB-01	3-LC-01
10:05~10:30	3-A-02	3-B-02	3-C-02
10:30~10:45	Coffee Break		
10:45~11:10	3-A-03	3-B-03	3-LC-03
11:10~11:35	3-A-04	3-B-04	3-C-04
11:35~12:00	3-A-05	3-B-05	3-C-05
12:00~13:30	Lunch		
13:30~13:55	3-A-06	3-LB-06	3-C-06
13:55~14:20	3-A-07	3-B-07	3-C-07
14:20~14:45	3-A-08	3-B-08	3-C-08
14:45~15:00	Break		
15:00~15:50	3-PL-02 (Room A)		
15:50~16:00	Closing Remarks (Room A)		

SCIENTIFIC PROGRAM (Provisional)
ORAL SESSION

Monday, August 7, 2000

Room A

(9:00~9:20) Opening Ceremony

(9:20~10:10)

1-PL-01 Mesoporous Molecular Sieves with Wormhole Frameworks, **T. R. Pauly, Y. Liu, W. Zhang, T. J. Pinnavaia, S. J. L. Billinge and T. P. Rieker**

(10:10~10:20) Break

(10:20~12:00)

1-LA-01 High Silica Zeolites with Three-Dimensional Systems of Large Pore Channels, **M. A. Camblor, P. A. Barrett, L. Å. Villaescusa, M. J. Díaz-Cabañas, A. Wölker and H. Koller**

1-A-02 Quantitative Analyses for TEA^+ and Na^+ Contents in Zeolite Beta with a Wide Range of Si/Al Ratio, **M. Matsukata, M. Ogura, T. Osaki, E. Kikuchi and A. Mitra**

1-A-03 Zeolite Beta Spheres, **L. Tosheva, B. Mihailova, V. Valtchev and J. Sterte**

1-A-04 Synthesis of Giant Zeolite Crystals by a Bulk-Material Dissolution Technique, **S. Shimizu and H. Hamada**

(12:00~13:30) Lunch

(13:30~14:20)

1-PL-02 High Throughput Experimentation in Zeolite Chemistry: Prospects for Combinatorial and Computational Techniques, **J. M. Newsam**

(14:20~14:30) Break

(14:30~15:45)

1-LA-05 Toward Rational Design and Synthesis of Aluminophosphates with 2-D Layer and 3-D Open-Framework Structures, **J. Yu, J. Li, Y. Xu, S. Qiu and R. Xu**

1-A-06 Tailoring Molecular Sieve Properties via Solvent-Extraction, **C. W. Jones, K. Tsuji, T. Takewaki, L. W. Beck and M. E. Davis**

1-A-07 Preparation of Well-Grown Chiral Zinc Phosphate Crystal Using Zinc-Containing Layered Double Hydroxide as the Starting Material, **K. Fuda, O. Shindo, K. Murakami and T. Matsunaga**

(15:45~16:00) Coffee Break
(16:00~17:15)
1-LA-08 Mechanisms, Processing, and Structural Characterization of Inorganic-Organic Composites and Porous Oxides, **B. F. Chmelka, S. C. Christiansen, M. T. Janicke, N. A. Melosh, G. D. Stucky, P. Yang and D. Zhao**
1-A-09 Cobalt Substitution in ETS10, **A. Eldewik and R. F. Howe**
1-A-10 Structural and Characteristic Properties of MOR Type Zeolites with Different Distribution of Al Atoms in the Framework, **K. Itabashi, M. Kato, A. Matsumoto and K. Tsutsumi**

Room B
(10:20~12:00)
1-LB-01 Structure-Property Relations in Zeolites for Gas Separations, **R. F. Lobo, R. Accardi, K. Bulanin and M. Feuerstein**
1-B-02 Equilibrium and Nonequilibrium Molecular Dynamics Studies of Diffusion in Model One Dimensional Micropores, **J. M. D. MacElroy and S.-H. Suh**
1-B-03 A Comparative Simulation Study of the Adsorption of Nitrogen and Methane in Siliceous Heulandite and Chabazite, **T. J. Grey, K. T. Travis, J. Gale and D. Nicholson**
1-B-04 Thermodynamics of Nitrogen and Oxygen Sorption on Zeolites LiLSX and CaA, **D. Shen and M. Bülow**
(12:00~13:30) Lunch
(14:30~15:45)
1-LB-05 MFI Membranes Made by Secondary (Seeded) Growth: Processing, Growth Mechanism, Microstructure and Separation Properties, **G. Xomeritakis, E. Kokkoli, V. Nikolakis, G. Bonilla, S. Nair, A. Gouzinis, D. G. Vlachos, S. Auerbach and M. Tsapatsis**
1-B-06 Oriented Zeolite MFI Crystal Monolayer Films and Membranes on Metal Supports, **Z. Wang and Y. Yan**
1-B-07 Densification Process for FAU Membrane Formed under Clear Solution Condition with Seed Crystals, **Y. Sasaki, W. Shimizu, I. Kumakiri and S. Nakao**
(15:45~16:00) Coffee Break
(16:00~17:15)
1-LB-08 CO_2 Separation with Zeolite Membranes, **Y. Ando, D. Yoshikawa, S. Mase and H. Taguchi**
1-B-09 Modification of Effective Pore Opening of MFI-Type Zeolite Utilizing Catalytic Cracking of Silane and Its Application to Preparation of H_2 Separation Zeolite Membrane, **T. Masuda, N. Fukumoto, M. Kitamura, S. R. Mukai and K. Hashimoto**
1-B-10 Estimation of Gas Permeability through Zeolite Membranes by a Novel Combined Molecular Simulation Technique, **R. Nagumo, S. Suzuki, H. Takaba and S. Nakao**

Room C
(10:20~12:00)
1-C-01 Asymmetric Oxidation of Sulfide to Sulfoxide on Ti-Containing MCM-41 Prepared by Template Ion-Exchange Method, **M. Iwamoto, Y. Tanaka, J. Hirosumi, N. Kita and S. Triwahyono**
1-C-02 Catalytic Conversion of Methane in the Presence of Ethene over Metal-Cation Loaded Zeolites, **T. Baba, H. Sawada, S. Kariura, Y. Tojo and Y. Ono**
1-C-03 Study of 3-, 2- and 1-Dimensional Zeolites for the Alkylation of i-Butane with 2-Butene, **P. G. Smirniotis, E. Burckle and K. Yoo**
1-C-04 The Development of a Zeolite Coated Structured Reactor for the Acylation of Aromatics, **A. E. W. Beers, T. A. Nijhuis, R. S. Downing, F. Kapteijn and J. A. Moulijn**
(12:00~13:30) Lunch
(14:30~15:45)
1-LC-05 Combinatorial Chemistry: The Kings New Clothes?, **D. Akporiaye, I. Dahl, A. Karlsson, M. Plassen, R. Wendelbo, D. S. Bem, R. W. Broach, G. J. Lewis, M. Miller and J. Moscoso**
1-C-06 Hydroamination of 6-Aminohex-1-yne over Zinc Based Homogeneous and Zeolite Catalysts, **T. E. Müller, J. Penzien and J. A. Lercher**
1-C-07 Synthesis of Zeolite ZSM-57 and Its Catalytic Properties in the n-Octane Cracking, **S.-H. Lee, D.-K. Lee, C.-H. Shin, H. H. Cho, W. M. Lee and S. B. Hong**
(15:45~16:00) Coffee Break
(16:00~17:15)
1-C-08 The Catalytic Property of New Molybdenum Dimer Oxy-Carbide Species Entrapped in Zeolites, **T. Shido, F. Nakagawa, Y. Noguchi, K. Asakura and Y. Iwasawa**
1-C-09 Investigation into Active Site for Isomerization of n-Butenes on the Micropore of Zeolites Studied by FT-IR, **E. Yoda, J. N. Kondo, F. Wakabayashi and K. Domen**
1-C-10 Stoichiometric Generation of Acid Site by Isomorphously-Substituted Aluminum in Y-Zeolite at High Aluminium Concentration, **Y. Kageyama, N. Katada and M. Niwa**

Tuesday, August 8, 2000

Room A
(8:40~9:30)
2-PL-01 Base Catalysis on Microporous and Mesoporous Materials: Recent Progress and Perspectives, **J. Weitkamp, M. Hunger and U. Rymsa**
(9:30~9:40) Break
(9:40~10:30)
2-A-01 Surfactant-Assisted Fabrication of Microporous Molecular Sieves with Microscopically and Hierarchically Ordered Structures, **L. Huang, J. Sun, L. Miao, Q. Li, D. Zhao, Z. Wang and Y. Yan**
2-A-02 Heteroepitaxial Growth of Cancrinite Thin Film on Sodalite Single Crystal, **T. Wakihara, J. Plévert, Y. Ogawa, H. Komiyama, M. Tsapatsis and T. Okubo**
(10:30~10:45) Coffee Break
(10:45~12:00)
2-A-03 Location of Structure Directing Organic Template Molecules in CoAlPO-34 Catalyst by Microcrystalline

Diffraction, **G. Sankar, G. Muncaster, J. K. Wyles, C. R. A. Catlow, J. M. Thomas and S. J. Teat**

2-A-04 Time-Resolved, *in-situ* High Resolution Neutron Diffraction Studies of Zeolite Crystallizations, **D. O'Hare and R. I. Walton**

2-LA-05 Syntheses of Mesoporous Materials Containing Organic Fragments within the Silicate Framework, **S. Inagaki and S. Guan**

(12:00~13:30) Lunch

(13:30~14:20)

2-PL-02 Growth Models of Microporous and Mesoporous Materials, **M. W. Anderson, J. R. Agger, N. Pervaiz and O. Terasaki**

(14:20~14:30) Break

(14:30~15:45)

2-A-06 Comprehensive Characterization of Highly Ordered MCM-41 Silicas Using Nitrogen Adsorption, Thermogravimetry, X-ray Diffraction and Transmission Electron Microscopy, **M. Jaroniec, M. Kruk, H. J. Shin, R. Ryoo, Y. Sakamoto and O. Terasaki**

2-A-07 Counterion Effect on the Formation and Stability of Mesoporous Silica, **H.-P. Lin, C.-P. Kao, S.-B. Liu and C.-Y. Mou**

2-A-08 *In-situ* Investigations of the Formation Mechanism of Mesoporous Materials via the Dynamics, Ordering and Inter-Molecular Interactions of Spin-Probes, **J. Zhang, Z. Luz and D. Goldfarb**

(15:45~16:00) Coffee Break

(16:00~16:50)

2-A-09 Layer-by-Layer Coating of Mesoporous Silica with Tin Oxide as a Possible Method to Give Conducting Mesoporous Materials, **Y. Teraoka, A. Yamasaki, N. Tomonaga, A. Yasutake, J. Izumi, I. Moriguchi and S. Kagawa**

2-A-10 Incorporation of Tris(2,2'-bipyridine)ruthenium(II) Complex Cation into a Mesoporous Silica, **T. Nakamura, J. Mori, K. Kuroda and M. Ogawa**

Room B

(9:40~10:30)

2-LB-01 *Ab initio* Theory in Zeolite Chemistry, **J. Sauer**

2-B-02 The MS-Q Force Field for Aluminophosphate Zeolites; Explanation of the Unusual Hydrophilicity in VPI-5, **O. Kitao, J. Sefcik, T. Cagin and W. A. Goddard III**

(10:30~10:45) Coffee Break

(10:45~12:00)

2-LB-03 First Principles Calculation of the Free Energy Barrier for the Reaction of Methanol in a Zeolite Catalyst, **M. C. Payne, M. Hytha, I. Štich, J. D. Gale and K. Terakura**

2-B-04 A Combinatorial Computational Chemistry Approach to the Design of Ion-Exchanged ZSM-5 for deNO_x Reaction, **K. Yajima, Y. Ueda, H. Tsuruya, T. Kanougi, Y. Oumi, S. Takami, M. Kubo and A. Miyamoto**

2-B-05 Quantum Chemical Calculations on the Stability of Different Conformations of Silicate Building Block Structures in Relevance to Zeolite Synthesis, **S. Krishnamurty, S. Pal, A. Goursot and R. Vetrivel**

(12:00~13:30) Lunch

(14:30~15:45)

2-LB-06 Novel Laser and Luminescent Materials Based Zeolites, **F. Schüth**

2-B-07 Formation of Various Types of Ni Metals in Cavity of Carbon Nanotubes, **K. Matsui, B. Pradhan, T. Kyotani and A. Tomita**

2-B-08 A New Approach to Assemble Zeolite Thin Fi over Substrates, **K. B. Yoon**

(15:45~16:00) Coffee Break

(16:00~16:50)

2-LB-09 Beyond Zeolites: Design and Synthesis of Hig Porous and Robust Metal-Organic and Inorg Frameworks, **M. Eddaoudi, H. Li, M. O'Ke and O. M. Yaghi**

2-B-10 A Novel Synthesis Route for High Surface A Spinels Using Ion Exchanged Zeolites as Precurs **W. Schmidt and C. Weidenthaler**

Room C

(9:40~10:30)

2-LC-01 Alkylation of Benzene with 1-Dodecene o Mordenite, **I. Wang, S.-J. Li and J.-Y. Liu**

2-C-02 Ritter-Type Reactions Catalyzed by High-Silica I Zeolites, **T. Okuhara and X. Chen**

(10:30~10:45) Coffee Break

(10:45~12:00)

2-LC-03 EPR Spectroscopy of Copper and Mangan Complexes Encapsulated in Zeolites, **D. Srini and P. Ratnasamy**

2-C-04 Decarbonylation of Group 6 Metal Carbonyl M(C (M = Cr, Mo and W) Encaged in Faujasite: Basi of Framework Oxygen, **Y. Okamoto and T. Kub**

2-C-05 Alkali and Alkaline-Earth Exchanged Faujasi Strength of Lewis Base and Acid Centres and Ca Site Occupancy in NaX and BaX Zeolites, **Martra, R. Ocule, S. Coluccia, L. March and G. Centi**

(12:00~13:30) Lunch

(14:30~15:45)

2-C-06 Enhancement of the Activity and Selectivity Hydro-Isomerization of n-Hexane over Pt Mordenite by Mesopore Generation, **J. H. Bitt J. A. van Bokhoven, M. Tromp, A. H. Janss K. P. de Jong and D. C. Koningsberger**

2-C-07 Hydrocracking of Tetralin over Zeolite-Suppor Metal Sulfide Catalysts, **T. Honma, K. Izawa, Ogawa, Y. Ohta and M. Yamada**

2-C-08 Synthesis of 2-Methyl Pyrazine over Modif Zeolites, **R. Anand, P. S. Mukund, R. K. Ah and B. S. Rao**

(15:45~16:00) Coffee Break

(16:00~16:50)

2-C-09 Highly Selective Formation of Catechol from Phe over Fe(II)/Pd(0) Incorporated Zeolites, **D. W. Al C. W. Lee and S.-E. Park**

2-C-10 Cu-Substituted Molecular Sieves as Liquid Ph Oxidation Catalysts, **B. Chou, J.-L. Tsai and Cheng**

Wednesday, August 9, 2000

Room A

(8:40~9:30)

3-PL-01 Unique Surface and Catalytic Properties of Mesoporous Aluminosilicates, **F. Fajula**

(9:30~9:40) Break

(9:40~10:30)

3-A-01 Change of Coordination of Cr Substituted Mesoporous Molecular Sieves Studied by X-ray Absorption Near Edge Structure, **C. Pak and G. L. Haller**

3-A-02 Preparation and Catalysis of Mono- and Bimetallic Nanowire and -Particle in FSM-16, **A. Fukuoka, N. Higashimoto, Y. Sakamoto, S. Inagaki, Y. Fukushima and M. Ichikawa**

(10:30~10:45) Coffee Break

(10:45~12:00)

3-A-03 Synthesis, Spectroscopy and Catalysis of $Cr(acac)_3$ Complexes Grafted onto MCM-41: Formation of Crystalline Polyethylene Nanofibers within Mesoporous Crystalline Aluminosilicates, **B. M. Weckhuysen, R. R. Rao and R. A. Schoonheydt**

3-A-04 Effects of Solvents on the Oxidation of Cyclohexene over Titanosilicate Mesoporous Molecular Sieves, **X. Lu, H. Nakajima and M. Koya**

3-A-05 Synthesis and Characterization of the Mesoporous Titanosilica, Ti-TUD-1, **Z. Shan, J. C. Jansen, L. Marchese and Th. Maschmeyer**

(12:00~13:30) Lunch

(13:30~14:45)

3-A-06 A New Efficient Mo-Catalyst for Olefin Metathesis: Mesoporous Silica-Supported Molybdenum Oxide (MoO_3/HMS), **M. Onaka, T. Ookoshi and T. Oikawa**

3-A-07 Preparation of Highly Dispersed Noble Metal Catalysts Using Ordered Mesoporous Carbon Molecular Sieve CMK-1, **S. Jun, S. H. Joo, Y. Xia, R. Ryoo, S. Y. Ryou and H.-Y. Lee**

3-A-08 Synthesis of New Mesoporous Carbons and Their Applications to Electrochemical Double-Layer Capacitors, **T. Hyeon, J. Lee, S. Yoon and S. M. Oh**

(14:45~15:00) Break

(15:00~15:50)

3-PL-02 Ti-Containing Hydrophobic Zeolites and Mesoporous Molecular Sieves as Liquid Phase Oxidation Catalysts, **T. Tatsumi**

(15:50~16:00) Closing Remarks

Room B

(9:40~10:30)

3-LB-01 Exploiting Preferred Orientation to Solve Complex Zeolite Structures, **L. B. McCusker**

3-B-02 Investigations of Host-Guest Interactions in Zeolitic Systems by FT-Raman Spectroscopy, **Y. Huang, E. A. Havenga, R. P. Poissant and P. Qiu**

(10:30~10:45) Coffee Break

(10:45~12:00)

3-B-03 NMR Investigations of the Structure of the Surface of Zeolite MTN, **C. Osterhoff, I. Wolf, H. Gies and C. A. Fyfe**

3-B-04 Aluminum Coordinations in Zeolites by 2D ^{27}Al Multiple Quantum MAS NMR Spectroscopy, **T.-H. Chen, B. H. Wouters and P. J. Grobet**

3-B-05 Electron Spin Echo Modulation Studies on Incorporation of Transition Metal Ions into MeAPO/MeAPSO Molecular Sieves, **A. M. Prakash, M. Hartmann, Z. Zhu and L. Kevan**

(12:00~13:30) Lunch

(13:30~14:45)

3-LB-06 Surface Structures of Some Zeolites Studied by Atomic Force Microscopy, **S. S. Ono, O. Matsuoka and S. Yamamoto**

3-B-07 Observation of Surface Atoms and Adsorbed Molecules on Zeolite (010) Surfaces by Atomic Force Microscopy, **M. Komiyama**

3-B-08 Determination of the Structure and Orientation of Clusters and Molecules in Cubic Zeolites by Raman Microprobe Polarization Measurements, **V. V. Poborchii**

Room C

(9:40~10:30)

3-LC-01 Photochemistry within a Confined Space: Zeolite as Media for Organic Photochemical Reactions, **V. Ramamurthy, A. Joy, M. Warrier, P. Lakshminarasimhan, S. Uppili, J. Shailaja, J. Sivaguru and K. J. Thomas**

3-C-02 Characterization of the VS-1 Catalyst Using Various Spectroscopic Techniques and Its Unique Photocatalytic Reactivity for the Decomposition of NO in the Absence and Presence of C_3H_8, **S. Higashimoto, M. Matsuoka, H. Yamashita, M. Anpo and O. Kitao**

(10:30~10:45) Coffee Break

(10:45~12:00)

3-LC-03 Zeolite Based Catalysts and Adsorbents for Environmental Applications Utilizing a Function of Hydrocarbon-Adsorption, **M. Nakano, H. Ogawa and K. Itabashi**

3-C-04 Deactivation of Mordenite-Type Zeolite Catalyst by HCl for the Reduction of NO_x with NH_3, **G. G. Park, H. J. Chae, I.-S. Nam, Y. G. Kim, J. W. Chung and K. H. Choi**

3-C-05 Solid State Ion Exchange to Prepare Active Cobalt Zeolite Catalysts, **Y. Li and J. N. Armor**

(12:00~13:30) Lunch

(13:30~14:45)

3-C-06 First Oxidative Dehydrogenation of Propane with TS-1 in the Gas Phase, **W. Schuster and W. F. Hölderich**

3-C-07 Hydrothermal Synthesis, Characterization and Catalytic Properties of Ti-MWW, **P. Wu, T. Tatsumi, T. Komatsu and T. Yashima**

3-C-08 Catalytic Properties of Fe Modified Titanosilicates in Benzene Oxidation with Nitrous Oxide, **L. Pirutko, V. Chernyavsky, K. Dubkov, A. Uriarte, M. Rodkin and G. Panov**

POSTER SESSION

Organizers will supply one upright panel (120 cm wide by 180 cm high) with your poster number and pins. In addition to the poster materials, the title of the poster as well as the names and affiliations of all authors should be prepared and displayed by

the presenter. On the day of your presentation, you can display your poster from the morning and we request you to remove it just after the poster session.

Monday, August 7, 2000 (17:15~19:15)

1-P-001 The Crystal Structure of Ferrierite, **Y. Yokomori, J. Wachsmuth and K. Nishi**

1-P-002 Preparation of Novel Uniform Mesoporous Silica-Alumina Catalyst, **N. Yao, G. Xiong, M. He, S. Sheng and W. Yang**

1-P-003 Synthesis of Fine-Controllable Pore Sized Mesoporous Silica by Using Hydrophobic Polymer as a Swelling Agent, **X. Cui, G.-H. Yoo, W.-J. Cho and C.-S. Ha**

1-P-004 Electron Spin Resonance Investigations on the Location and Reducibility of Ti and Zr Ions in Titano- and Zircono-Silicate Molecular Sieves TiMCM-41 and Zr-MCM-41, **K. Chaudhari, R. Bal, T. K. Das, A. Chandwadkar, D. Srinivas and S. Sivasanker**

1-P-005 Hydrothermal Synthesis and Crystal Structures of Two Novel Open Frameworks: $(enH)_6[Co_3W_4P_4O_{28}]$ and $(4,4'\text{-bpy})_{0.5}[WO_3]$, **B. Yan and Y. Xu**

1-P-006 DRIFTS and TPD Characterization of Surface Properties of TiO_2-Sepiolite Support: The Generation of Enhanced Acidity, **S. M. Jung and P. Grange**

1-P-007 Transformation of Zeolites 4A into Hidrosodalit, **B. Cekova and V. Zlatanovic**

1-P-008 Synthesis of the Zeolite ZSM-5 and Its Structural Testing, **B. Cekova and V. Zlatanovic**

1-P-009 Aging Effects on the Nucleation Period for Crystallization of Colloidal TPA-Silicalite-1, **Q. Li, B. Mihailova, D. Creaser and J. Sterte**

1-P-010 Post-Synthesis Alumination of MCM-41 Using Trimethylaluminium, **H. Takagi, R. Mizuno, S. Sumiya, Y. Oumi, T. Uozumi and T. Sano**

1-P-011 Synthesis of Zeolites in the Presence of Alcohol, **T. Kubota, A. Suzuki, Y. Oumi, T. Uozumi and T. Sano**

1-P-012 Synthesis of Novel Aluminosilicate Using Inert Rhodium(III) Complexes as Structure Directing Agents, **Y. Takagi**

1-P-013 Synthesis and Stability Evaluation of Organically Modified MCM-41 Type Materials, **N. Igarashi and T. Tatsumi**

1-P-014 Synthesis of Silicates Using Benzyl Quaternary Ammonium Chlorides as Templates, **Z.-Y. Yuan, J.-Z. Wang and H.-X. Li**

1-P-015 Preparation of Iron-Containing Zeolites for Acid Catalysts, **A. Katovic and G. Giordano**

1-P-016 Preparation and Characterization of Zincosilicates with MFI Structure, **G. Giordano, S. Kowalak, E. Szymkowiak and A. Katovic**

1-P-017 Characterization of Initial Stage of Low Temperature Synthesis of TPA-Silicalite-1, **Y. Mori and T. Mizuno**

1-P-018 *In-situ* Characterization of Hydrotalcite-Like Compounds Using Mg and Al K-edge XAFS Spectroscopy, **J. A. van Bokhoven, J. C. A. A. Roelofs, A. M. J. van der Eerden, K. P. de Jong and D. C. Koningsberger**

1-P-019 New Insights on the Thermal Analysis of Pt/Zeolite Catalysts, **A. K. Aboul-Gheit and A. A. Al-Owais**

1-P-020 Studies on ZrAPO-5 Molecular Sieves, **J. Kornatowski, M. Rozwadowski, W. Lutz and J. A. Lercher**

1-P-021 Double Organic Modification on Mesoporous Silica, **A. Bhaumik and S. Inagaki**

1-P-022 Syntheses of Mesoporous Materials from Layered Silicic Acids Prepared from Clay Minerals by Acid Treatments, **S. Ogata, S. Inagaki and Y. Fukushima**

1-P-023 Si-MPO - Novel High Porosity Mesoporous Silica, **U. Müller**

1-P-024 Preparation and Characterization of Microporous Materials Derived from Kanemite, **T. Takei, Y. Tamura, S. Kobayashi, M. Fuji, T. Watanabe and M. Chikazawa**

1-P-025 Synthesis and Properties of Kanemite Containing Aluminum, **S. Toriya, T. Takei, M. Fuji, T. Watanabe and M. Chikazawa**

1-P-026 Novel Composite: ZSM-5/Porous Mullite from Sintered Kaolin Honeycomb by Hydrothermal Reaction, **H. Katsuki and S. Komarneni**

1-P-027 Synthesis and Acidic Properties of Ga-Substituted MCM-22 Zeolite, **F. Testa, L. Pasqua, R. Aiello, B. Onida, F. Geobaldo and E. Garrone**

1-P-028 Crystallization of MCM-49 and MCM-22 Zeolites from Systems Containing Sodium and Potassium, **F. Testa, L. Pasqua, R. Aiello and D. Vuono**

1-P-029 Influence of Aluminium Introduction on Structure and Properties of Zeolites VPI-8, **O. V. Shvets, G. M. Tel'biz, P. S. Yaremov and V. G. Il'in**

1-P-030 Influence of Acidity on Mesoporous Silica Growth with Rotation Forms, **O. V. Shvets, G. M. Tel'biz, P. S. Yaremov and V. G. Il'in**

1-P-031 Electron Crystallography for Structural Study of 3-D Mesoporous Materials, **O. Terasaki, Y. Sakamoto, M. Kaneda, A. Carlsson, L. Zheng, T. Ohsuna, K. Hiraga, R. Ryoo, S. H. Joo, C. H. Ko and G. D. Stucky**

1-P-032 Characterization of Meso- and Micro-Pore Structure on Block Copolymer Templated Mesoporous Silica, **A. Endo, M. Nakaiwa, T. Nakane, H.-S. Zhou and I. Honma**

1-P-033 Synthesis of Mesoporous Silicate Materials Using Block Copolymer as Template, **T. Yamada, K. Asai, K. Ishigure, H.-S. Zhou and I. Honma**

1-P-034 Zeolite Synthesis Using Alkane-bis(triethylammonium) Salts as Structure-Directing Agents, **M. Inaba and H. Hamada**

1-P-035 Inorganic Ion Exchange Membranes of Insoluble Acid Salts of Tetravalent Metals, XVI. Effect of H_3PO_4 Concentration on the Degree of Crystallinity of Pellicles of Mixed Zirconium-Titanium Phosphates, **S. K. Shakshooki, A. N. Eldewik and F. A. Terish**

1-P-036 Synthesis and Characterization of Cobalt Substituted Microporous Titanosilicate ETS10, **A. N. Eldewik and R. F. Howe**

1-P-037 Structure Change of Molecular Sieve SAPO-37 at High Temperature Studied by ^{27}Al Multiple Quantum and Multi-Nuclear MAS NMR, **T. Chen, B. H. Wouters and P. J. Grobet**

1-P-038 Preparation and Some Characterizations of Gold-Based Nanoparticles on HY Zeolites, **G. Riahi, D. Guillemot, M. Polisset-Thfoin, D. Bonnin and J. Fraissard**

1-P-039 Improvement in Hydrophobicity of MCM-41 by Surface Modification with Grignard Reagent, **K. Yamamoto and T. Tatsumi**

1-P-040 Infrared Characterization of Hydroxyl Groups in Synthetic Chabazites, **I. V. Karetina, M. A. Shubaeva, S. S.**

Khvoshchev and L. Ja. Suslova

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1-P-042 Dissolution of MFI Zeolite Using NaOH Alkaline Aqueous Solution, **M. Ogura, Y. Nara, S. Shinomiya, J. Tateno, M. Matsukata and E. Kikuchi**

1-P-043 Novel CVD-Coated Catalyst for the Dehydroaromatization of Methane, **S. Jaenicke and Y. Wang**

1-P-044 Measurement and Modeling of the Transient Adsorption, Desorption and Diffusion Processes in Zeolites, **T. A. Nijhuis, M. Makkee, F. Kapteijn and J. A. Moulijn**

1-P-045 Selective Adsorption of Unsaturated Linear C_4 Molecules on DD3R, **W. Zhu, F. Kapteijn and J. A. Moulijn**

1-P-046 Shape Selectivity in the Adsorption of Propene/Propane on DD3R, **W. Zhu, F. Kapteijn and J. A. Moulijn**

1-P-047 Adsorption Properties on Cubic and Orthorhombic LiLSX, **S. Yoshida, S. Hirano, A. Harada and M. Nakano**

1-P-048 Preparation of Porous Carbon Membrane Plate (PCMP) and Its Application for Pervaporation Separation of Acetic Acid - Water Mixture, **A. Muto, Md. A. Uddin, K. Honda, H. Suga and Y. Sakata**

1-P-049 A Differential Geometrical Study of Adsorption of Normal and Branched Alkanes on Zeolite Surfaces, **L. Dixit**

1-P-050 Synthesis of Low Silica MFI Membranes by a Steam-Assisted Conversion Method, **M. Nomura, S. Shinomiya, S. Kitagawa, E. Kikuchi and M. Matsukata**

1-P-051 Application of Photochemical Techniques to Studying the Adsorption and Mobility of Guest Aromatic Species within Zeolites, **S. Hashimoto**

1-P-052 A New Method to Determine Relative Diffusion Coefficients in Zeolites under Reaction Conditions, **R. Bauernschmitt and E. Klemm**

1-P-053 Textural Study by Adsorption-Desorption of Nitrogen of Porous Silico-Zirconate Membrane, **N. Agoudjil, N. Benmouhoub and A. Larbot**

1-P-054 Transition State of Methane Activation over Ion-Exchanged Zeolites, **Y. Ueda, K. Yajima, S. Takami, M. Kubo and A. Miyamoto**

1-P-055 Self-Arrangement of Pyridine and Its Derivatives on the Outer Surface of HEU(010) Studied by Computational Chemistry, **Y. Yokoi, Y. Kobayashi, Y. Oumi, S. Takami, M. Kubo, A. Miyamoto and M. Komiyama**

1-P-056 Permeation of CO_2/N_2 Mixture through the NaY Zeolite Membrane as Investigated by Molecular Dynamics Simulation, **K. Mizukami, Y. Kobayashi, H. Morito, S. Takami, M. Kubo and A. Miyamoto**

1-P-057 An Interaction of Ethylene Glycol with Disilicic Acid and Its Conformational Transformation on the Silicate Surface, **M. Sato**

1-P-058 Molecular Simulation of Pervaporation in Silicalite Membrane, Using Dual Ensemble Monte Carlo (DE-MC) Technique, **H. Takaba, A. Koyama and S. Nakao**

1-P-059 Theoretical Study of the Siting of Cu(II) in Mordenite, **A. Delabie, K. Pierloot, M. H. Groothaert, B. M. Weckhuysen and R. A. Schoonheydt**

1-P-060 DFT/*ab initio* Study of the Coordination of Cu^{2+} in Zeolites. Relation between Structure and Spectroscopy, **M. Groothaert, B. Weckhuysen, R. Schoonheydt, A. Delabie and K. Pierloot**

1-P-061 Shape-Selective Acylation of 2-Methoxynaphthalene over Zeolite Beta Catalysts: A Computational Analysis Using Quantum Chemical Docking Calculations, **P. Bharathi, S. Sivasanker and R. Vetrivel**

1-P-062 Molecular Simulation for Adsorption of Chlorocarbons in High-Silica Zeolite, **K. Chihara, R. Kamiyama, H. Mangyou, M. Omote, C. F. Mellot and A. K. Cheetham**

1-P-063 Synthesis and Adsorption Property of Microporous Clay Pillared with Barium Ferrite, **R. Yu, D. Wang, N. Kumada and N. Kinomura**

1-P-064 Photo- and Temperature-Induced Phase Transformations of the Asbestos-Nanotube-Confined Selenium, **V. V. Poborchii, A. V. Kolobov and K. Tanaka**

1-P-065 Crystal Structure of a Cyclopropane Sorption Complex of Dehydrated Fully Mn^{2+}-Exchanged Zeolite X, **E. Y. Choi, Y. W. Han, Y. Kim and K. Seff**

1-P-066 Photothermal Deflection Spectroscopy of C_{60} and C_{70} Embedded in FSM-16, **H. Habuchi, S. Nitta, K. Kitamura, A. Nishibe and S. Nonomura**

1-P-067 Mercuric Iodide Confined in Aluminophosphate-Based Molecular Sieves, **J.-S. Chen, G.-D. Li and Z.-K. Tang**

1-P-068 Monitoring the Brönsted Acidity of Zeolites by Means of *in-situ* FTIR Using Chloromethane as a New Probe Molecule, **B.-L. Su and D. Jaumain**

1-P-069 Highly Shape Selective Mordenite Catalysts for Naphthalene Alkylation: Preparation and Multitechnique Characterization, **B.-L. Su**

1-P-070 Bifunctional Zeolite Based Catalysts in Isomerization of Paraffins in the Presence of Aromatics, **S. V. Lopatkin, V. G. Stepanov and K. G. Ione**

1-P-071 The Main Origin of CO_2 during Partial Oxidation of Methane to Syngas over a Ni/Al_2O_3 Catalyst, **L. Chunyi and S. Shikong**

1-P-072 Preparation, Characterization and Application of Sulfated Mesoporous Molecular Sieve Al-MCM-41, **C.-Y. Chou, L.-W. Chen and A.-N. Ko**

1-P-073 The Improvement of Some Refining Processes by Utilization of a New LAY Zeolites, **M. I. Levinbuk, T. V. Vasina, L. M. Kustov, O. V. Masloboishchikova, M. L. Pavlov and J. P. Fraissard**

1-P-074 Oxydehydrogenation of Propane over Vanadyl Ion-Containing VAPO-5 and CoAPO-5, **M. Okamoto, L. Luo, J. A. Labinger and M. E. Davis**

1-P-075 Hydrothermal Synthesis and Photocatalytic Activity of Mesoporous Anatase, **H. Hayashi, T. Ebina, T. Nagase, Y. Onodera, T. Iwasaki and K. Torii**

1-P-076 Some Peculiarities of the Cumene Cracking over the NaY and NaY-Containing Microsphere, **K. I. Patrylak, R. V. Likhnyovskyi, L. K. Patrylak and I. A. Manza**

1-P-077 Distribution of the Products in n-Hexane Isomerization over the Modified Natural Zeolites in Consequence of Reaction Mechanism, **K. I. Patrylak, F. M. Bobonych, O. M. Yakovenko, Yu. G. Voloshyna and M. M. Levchuk**

1-P-078 Gas-Phase Oxidation of Benzene over CuH-ZSM-5 Zeolites, **R. Hamada, S. Nishiyama and S. Tsuruya**

1-P-079 Selective Formation of Alkenes through the Cracking of Heptane on Ca-Ferrierite, **T. Komatsu, H. Ishihara, Y. Fukui and T. Yashima**

1-P-080 Activity Enhancement of Mesoporous Silica FSM-16 by

Modification with Ammonium Sulphate for Acid-Catalyzed Reactions, **J. K. A. Dapaah, Y. Uemichi, A. Ayame, H. Matsuhashi and M. Sugioka**

1-P-081 Characterization of Mesopores of HY Zeolite, **K. Sato, K. Honna, Y. Nishimura and H. Shimada**

1-P-082 Comparative Investigation on the Decomposition and Selective Catalytic Reduction of N_2O over Rh and Fe-Zeolite Catalysts: The Effect of Coexistent Gases, **S. Kameoka, K. Yuzaki, T. Takeda, S. Ito, T. Miyadera and K. Kunimori**

1-P-083 Conversion of Methanol to Hydrocarbons on Acidic HZSM-5, HMOR, HSAPO-34 and HSAPO-18 Investigated by *in situ* MAS NMR Spectroscopy under Flow Conditions and On-Line Gas Chromatography, **M. Hunger, M. Seiler and A. Buchholz**

1-P-084 Vapor Phase Beckmann Rearrangement of Cyclohexanone Oxime Catalyzed by Layered Silicates, **Y. Ko, M. H. Kim, S. J. Kim and Y. S. Uh**

1-P-085 Synthesis and Photocatalytic Properties of Titania Pillared Hydrogen Tetratitanate Using Titanyl Acylate Precursor, **M. Yanagisawa, S. Uchida and T. Sato**

1-P-086 Photoreduction of NO_3^- and Photoproduction of Hydrogen from TiO_2 and TiO_2 Pillared $H_4Nb_6O_{17}$ Nanocomposites with and without Pt Loading, **S. Tawkaew, Y. Shu, S. Uchida and T. Sato**

1-P-087 Benzene Hydroxylation over H-Ga-FER Zeolite, **S. S. Shevade, R. K. Ahedi and B. S. Rao**

1-P-088 Allylation of Phenolic Compounds over Modified Beta Zeolites, **N. R. Shiju, T. M. Jyothi, T. Mathew, S. Shevade and B. S. Rao**

1-P-089 Local Structures of Ti-HMS Mesoporous Molecular Sieves and Their Photocatalytic Reactivity for the Decomposition of NO into N_2 and O_2, **J. Zhang, M. Anpo, M. Minagawa and H. Yamashita**

1-P-090 Local Structure of the Silver (I) Ion-Exchanged ZSM-5 and Its Photocatalytic Reactivity for the Decomposition of N_2O into N_2 and O_2, **M. Matsuoka, W.-S. Ju, H. Yamashita and M. Anpo**

1-P-091 Effect of Hydrocarbon Species on Diffusivity for the SCR of NO by Hydrocarbon over Cu-MFI Zeolite, **A. Shichi, A. Satsuma and T. Hattori**

1-P-092 Multistage Photoexcitation Process in Photometathesis of Propene over FSM-16, **Y. Inaki, H. Yoshida and T. Hattori**

1-P-093 Photocatalytic Oxidation of Propene by Molecular Oxygen over Titanium Silicates, **C. Murata, H. Yoshida, K. Nishi, Y. Yokomori and T. Hattori**

1-P-094 Combined-Modifications: A Useful Method to Prepare Durable, Active and Highly Para-Selective Catalyst from Large Crystal ZSM-5 Zeolite, **H. Guo, G. Wang and X. Wang**

1-P-095 Environmentally Friendly Para-Selective Halogenation over Zeolite Catalysts, **A. P. Singh and S. M. Kale**

1-P-096 Photocatalysed Reaction of Meso-Tetraphenylporphyrin on Mesoporous TiMCM-41 Molecular Sieves, **V. Kandavelu, M. R. Dhananjeyan, R. Renganathan, S. K. Badamali and P. Selvam**

1-P-097 Shape-Selective Synthesis of Para-Cresol by Direct Oxidation of Toluene with Nitrous Oxide Using ZSM-5-Type Zeolites, **B. Vogel, J. Reiser and E. Klemm**

1-P-098 Properties of MCM-22 as a Solid Acid Catalyst, **A. K. Talukdar, K. G. Bhattacharyya, T. Baba and Y. Ono**

1-P-099 Control of Concentration of Very Strong Acid Site Due to Non-Framework Al in HZSM-5, **A. Kohara, N. Katada and M. Niwa**

1-P-100 Silver-Loaded Siliceous Ferrierite for a Light-Hydrocarbon Trap Material, **H. Ogawa, Y. Ito, M. Nakano and K. Itabashi**

1-P-101 Synthesis of Mesoporous Alumino- and Titano-Silicates by Rapid Room Temperature Method and Their Application to Water Bleaching, **I. Moriguchi, K. Ideguchi, M. Honda, N. Tomonaga, A. Yasutake, J. Izumi and Y. Teraoka**

1-P-102 The Testing of a New Filtering Material Based on Natural Clinoptilolit for the Elimination of Mn^{2+} Ion from Water, **G. Burtica, S. Herman, R. Pode, A. Iovi, V. Pode and L. Vlaicu**

1-P-103 The Introduction of Manganesed Clinoptilolitic Zeolite in the Treatment Technology of Underground Water, **R. Pode, S. Herman, G. Burtica, A. Iovi, E. Popovici and I. Cârlb**

1-P-104 Adsorption of Some Heavy Metals on Geomaterials, **M. Z. Rabah and A. Benghalem**

1-P-105 Solid-State NMR Studies on the Stability of Nanosized HZSM-5 Zeolite, **W. Zhang, X. Han, X. Liu, X. Bao, X. Guo and X. Wang**

1-P-106 Simultaneous Crystallization of MCM-22 with Kenyaite, **M. Cheng, D. Tan, X. Liu, X. Han, X. Bao and L. Lin**

1-P-107 Active Site for the Decomposition Reaction of α-Methylstyrene Dimer, **C.-G. Park, J.-H. Kim and G. Seo**

1-P-108 IR Study on the Reaction Path of Skeletal Isomerization of 1-Butene, **M.-Y. Kim, J.-H. Kim and G. Seo**

1-P-109 Triclinic Crystal Structure Determination of a Natural Chabazite, **M. Taniguchi**

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2-P-001 Textures and Crystal Structures of Yugawaralite and Edingtonite, **T. Tanaka, R. Kimura, M. Akizuki and Y. Kudoh**

2-P-002 Synthesis of MCM-41 with Small Pore Size, **V. T. Nghiem, C. Naccache and P. Mériaudeau**

2-P-003 Control of Pore Structure of Trioctahedral Smectite Materials, **M. Shirai, K. Aoki, K. Torii and M. Arai**

2-P-004 Synthesis of New Microporous Silicoaluminophosphate, $Si_2AlP_3O_{13}$, with Template Free and Its Characterization by Solid State NMR, **H. Nakayama, H. Kataoka, Y. Taketani and M. Tsuhako**

2-P-005 Zeolite Synthesis Using DABCO Derivatives as Structure-Directing Agents, **T. Takewaki, L. W. Beck and M. E. Davis**

2-P-006 Mixed Oxides Pillared Silicates from H-Ilerite by Intercalation, **K. Kosuge and P. S. Singh**

2-P-007 Characterization of Lithium Cations in Hydrated LiCaNaK-LSX by ^7Li Nuclear Magnetic Resonance Satellite Transition Spectroscopy (SATRAS), **H. Oka, S. Kasahara, S. Yoshida, T. Okada, H. Ohki and T. Okuda**

2-P-008 Solvothermal Synthesis and Characterization of a New 3-D

Open-Framework Aluminophosphate $[Al_2P_3O_{12}][C_4N_3H_{16}]$, **B. Wei, J. Yu, S. Qiu, Z. Zhang, G. Zhu and O. Terasaki**

2-P-009 Spatially Structured Materials: Controlling the Pore Size Distribution on the Micro-, Meso- and Macro-Scales, **M.-O. Coppens, J. H. Sun, Z. Shan, J. A. Moulijn, J. C. Jansen and Th. Maschmeyer**

2-P-010 Silicalite-1 Zeolite Membrane: Synthesis and Performance Characterization, **L. Gora, N. Nishiyama, J. C. Jansen, F. Kapteijn and Th. Maschemeyer**

2-P-011 Zinc Containing ZSM5 Molecular Sieves: Physico-Chemical Properties, **L. Frunza, R. Ganea and R. Bîrjega**

2-P-012 Mesoporous Silicates from Various Silica Sources, **Y. Goto, Y. Fukushima, Y. Imada, Y. Kubota and Y. Sugi**

2-P-013 Alignment of Mesochannels in Mesoporous Silica Films through Interactions at Solid-Liquid Interfaces, **H. Miyata and K. Kuroda**

2-P-014 Synthesis, Characterization and Photocatalytic Activity of Mesoporous Tantalum Oxide, **Y. Takahara, T. Takata, D. Lu, M. Hara, J. N. Kondo and K. Domen**

2-P-015 Structure-Direction Effects during the Synthesis of Microporous SiO_2 Phases with ITE, STF and SFF Topologies, **L. Å. Villaescusa, M. Puche and M. A. Camblor**

2-P-016 *In situ* NMR and XRD Measurements during Formation of SAPO-34 under Hydrothermal Syntheses Conditions, **Ø. Vistad, E. W. Hansen, D. Akporiaye, K. P. Lillerud and F. Taulelle**

2-P-017 Microwave-Assisted Synthesis of Aluminophosphate Molecular Sieves, SAPO-11 and SAPO-34, **S. M. Yang, L. J. Lin and C. C. Chang**

2-P-018 Synthesis of Mo-SBA-1 Cubic Mesoporous Molecular Sieves, **S. Che, J. Fukuda, N. Hamakawa, H. Yoshitake and T. Tatsumi**

2-P-019 Crystal Growth of Coffin-Shaped MFI Zeolite, **M. Matsukata, S. Inagaki, I. Matsunaga and E. Kikuchi**

2-P-020 A New Technique for Determining TEA^+ Associated with the Acid Sites in As-Synthesized Zeolite Beta: *In situ* Temperature-Programmed Desorption of Ammonia, **A. Mitra, E. Kikuchi and M. Matsukata**

2-P-021 An *in situ* Calorimetric Study of Zeolite Synthesis in the System: xNa_2O-$1.00Al_2O_3$-$3.3SiO_2$-$165H_2O$, x=2.4 to 6.9, **S. Yang and A. Navrotsky**

2-P-022 Effect of Synthesis Factors on Mechanical Stability of V-MCM-41, **S. Lim and G. L. Haller**

2-P-023 Hydrothermal Synthesis and Crystal Structure of a Novel Cerium Phosphate with Open-Framework, **D. Wang, R. Yu, N. Kumada and N. Kinomura**

2-P-024 Characterization of Metal Ion Substituted Silicoaluminophosphate (MeAPSO-34), **H. Nishiguchi, T. Ishihara and Y. Takita**

2-P-025 Synthesis and Properties of ZnAlPO Molecular Sieves, **S. Kowalak and K. Stankiewicz**

2-P-026 Effect of Organic Structure-Directing Agents on Crystal Size and Morphology in the Synthesis of ZSM-12 (MTW), **Y. Kubota, A. Seriu, Y. Sugi, Y. Goto, Y. Fukushima, S. Ritsch and O. Terasaki**

2-P-027 Stability of DABCO-Based Structure-Directing Agent, **Y. Kubota, T. Honda, A. Nagase, Y. Imada, Y. Goto, Y. Fukushima and Y. Sugi**

2-P-028 Synthesis of Aluminophosphate Molecular Sieves by Dry-Gel Conversion Method, **M. Bandyopadhyay, R. Bandyopadhyay, Y. Kubota, Y. Goto, Y. Fukushima and Y. Sugi**

2-P-029 Studies of Crystallization and Characterization of ETS-4 from Gel Containing Zirconium, **D. Vuono, P. De Luca and A. Nastro**

2-P-030 Synthesis and Characterization of Molecular Sieves ETS with Iron: ET(Fe)S-10, **P. De Luca, D. De Luca and A. Nastro**

2-P-031 *In situ* Spectroscopy of the Formation of Microporous Transition-Metal Ion Containing Aluminophosphates under Hydrothermal Conditions, **B. M. Weckhuysen, D. Baetens and R. A. Schoonheydt**

2-P-032 Synthesis and Characterization of Zinc-Containing Mordenite, **M. Dong, J. Wang and Y. Sun**

2-P-033 A Combined Spectroscopic and Catalytic Study of the NO Reactivity on CoAPO-34 and CuAPO-34 Catalysts, **L. Marchese, E. Gianotti, A. Frache, G. Martra, B. Palella, R. Pirone and P. Ciambelli**

2-P-034 Synthesis of Ordered Silica Using Short-Tail Amphiphiles in the Boundary between Microporous and Mesoporous Regions, **R. Ryoo, I.-S. Park and S. Jun**

2-P-035 Ti-[RUT]: Synthesis and Characterization of Ti-RUB-10, **M. Kleinsorge, U. Müller and H. Gies**

2-P-036 The Influence of the Amounts of Tetrapropylammonium Hydroxide on the Synthesis of Titanium Silicalite-1, **S.-B. Cheng, W. Wu and E.-Z. Min**

2-P-037 Monitoring the Morphology and Crystal Size by Dilution of the Gel: A New Synthesis Procedure of ZSM-5 Zeolites, **B.-L. Su**

2-P-038 An Infrared Study of Molecular Recognition: Effect of Ammonia and Methylamine as Coadsorbates on the Adsorption Selectivity of Benzene in NaBeta Zeolite, **B.-L. Su and V. Norberg**

2-P-039 Selective Adsorption of Palladium on Insoluble Ferrocyanide-Loaded Porous Materials, **H. Mimura, M. Kimura, K. Akiba and Y. Onodera**

2-P-040 Anomalous Hydrogen Sorbing Behavior of Palladium Included in Y-Zeolites, **N. Nishimiya, T. Kishi, A. Matsumoto and K. Tsutsumi**

2-P-041 Chemical Vapor Deposition of Silica on Silicalite Crystals and Shape Selective Adsorption, **H. A. Begum, T. Nakao, N. Katada and M. Niwa**

2-P-042 Characteristics of Al-MCM-41 Modified by Controlled Coking, **M. Rozwadowski, M. Lezanska, J. Wloch, K. Erdmann, R. Golembiewski, J. A. Lercher and J. Kornatowski**

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2-P-094 Templating Role of Microporous Zeolites for Selective Dehydro-Condensation of Methane to Benzene on Rhenium Based Catalysts, **M. Ichikawa, K. Isoo, L. Xu and R. Ohnishi**

2-P-095 Hydroisomerization and Hydrocracking of n-Dodecane on Pt/AlMCM-41, **W. Xu, L. Huang, C. Nie and Q. Li**

2-P-096 Medium Acidity Induced by Hybridization between $Cu/ZnO/ZrO_2$ and SAPO-34 or HZSM-5 in CO_2 Hydrogenation, **S.-K. Ihm, Y.-K. Park and S.-W. Baek**

2-P-097 Oscillatory Adsorption: On the Treatment of Concentration Oscillations in Heterogeneous Catalysis as Self-Oscillations, **K. I. Patrylak, L. K. Patrylak, O. M. Taranookha and J. Fraissard**

2-P-098 On the Mechanism of Cumene Cracking on Zeolite Catalysts, **L. K. Patrylak, K. I. Patrylak and J. Fraissard**

2-P-099 Microwave Heating, Dielectric Properties and Cation Distribution in A Zeolites, **T. Ohgushi, K. Ishimaru and T. Kajiyama**

2-P-100 Photocatalytic Decomposition of NO on Cr-Containing Mesoporous Molecular Sieves under Visible Light Irradiation, **H. Yamashita, M. Ariyuki, S. Higashimoto, K. Yoshizawa and M. Anpo**

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2-P-103 Reactive Oxygen Species Formation by Silver-Loaded Zeolite under the Visible Ray Irradiated Condition and Its Application to an Antibacterial Material, **Y. Inoue and Y. Kanzaki**

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2-P-109 The Preparation and Characterization of a Novel Solid Superacid, **Z.-M. Wang and Z.-F. Yan**

2-P-110 Mechanical Behavior of Nickel-Based Catalysts Used for Dry Reforming with Methane, **A. Yuan, R.-G. Ding and Z.-F. Yan**

Language

All submitted papers and presentations must be in English.

Proceedings

The Proceedings of the Symposium will be published after a scientific review as a special issue of Microporous and Mesoporous Materials including plenary lectures, invited lectures, and oral papers. Manuscripts should be due at the Proceeding desk of the Symposium site on August 7, 2000.

TRAVEL INFORMATION

Access from Narita Airport

JR Narita Express Train leaves Narita Airport every half hour for Tokyo and other stations. All Narita Express Trains stop at Tokyo Station; please get off the train at Tokyo Station. Travel time is about 1 hour. All seats are reserved. From Tokyo Station, take the JR Bullet Train, Tohoku Shinkansen, to Sendai Station. Travel time is about 2 hours. JR tickets are available at the JR Station located on the B1 floor of Narita Airport. If you purchase tickets from Narita Airport to Sendai Station, the cost is JPY 13,700.

Access from Sendai Airport

Airport limousine bus service is available from Sendai Airport to JR Sendai Station. It takes about 1 hour and costs JPY 910. The first bus leaves Sendai Airport at 9:10 and departs every 10 to 20 min. until 20:30. Bus schedule is subject to change with or without notice.

Banking Facilities in Japan

Traveler's checks and currencies from most countries can be exchanged for Japanese Yen at most banks and some hotels in Sendai. However, it is recommended that currency is exchanged at Narita or Sendai Airport upon arrival. International credit cards such as American Express, Visa, MasterCard and Diners

Club are accepted at major hotels. ATMs are open until 19:00 every day.

Passport and Visa

All visitors to Japan must have a valid passport. It is the responsibility of each participant to obtain all the necessary documents, including a visa if necessary, for entry into Japan. Contact a travel agent or your closest Japanese consulate for details.

Climate

It is usually hot and humid throughout the summer. The average temperature for August in Sendai is 25 degrees Celsius (maximum 29 degrees Celsius and minimum 21 degrees Celsius) with average humidity at 79 %.

Other Information

Airport Tax:	Not required at Sendai Airport. Passenger Service Facility Charge (PSFC) JPY 2,040 at Narita Airport is usually included in the ticket price.
Tipping:	Not required in Japan. Service charge required at certain restaurants.
Consumption Tax:	Usually 5 % of price
Electricity:	100 volts AC, 50 Hz in Sendai
Time Difference:	Plus 9 hours from GMT, no daylight saving time
Business Hours:	
Banks	9:00 - 15:00
	Closed on Saturday, Sunday and holidays
Post Office	9:00 - 17:00
	Closed on Saturday, Sunday and holidays
Shops	10:00 - 18:00

Insurance

The Organizing Committee accepts no liability for any accident whatsoever. Participants should personally arrange for the necessary insurance coverage.

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Research Association for Computer Application to Catalyst Research in Catalysis Society of Japan

ZPMC 2000 参加費割引のお知らせ

2000年8月6日(日)～9日(水)に仙台国際センターにてInternational Symposium on Zeolites and Microporous Crystals (ZMPC 2000)をゼオライト学会の主催にて開催致します。

本国際会議の参加費をゼオライト学会会員の皆様には下記のように割引させて頂きたいと思いますので，奮ってご参加のほどお願い申し上げます。本参加費には，バンケット，7～9日の3日間の昼食，ウエルカムパーティー，アブストラクト，プロシーディングスが含まれております（学生と同伴者の参加費にはプロシーディングスは含まれておりませんが他は全て含まれております)。

一般事前	6万円	会員事前	5万5千円
一般当日	7万円	会員当日	6万5千円
学生事前	2万円	学生事前	2万円
学生当日	3万円	学生当日	3万円
同伴者	1万円	同伴者	1万円

特に本国際会議は，東北3大祭の1つであります仙台七夕と同時期に開催されますので，ご家族での参加も歓迎しております。

Application FormはZMPC 2000のホームページ（http://www.zmpc2000.aki.che.tohoku.ac.jp）からダウンロードできます。

注意：RegistrationのApplication FormとFinal Circularには会員割引の記述はありませんが，Application Form記載の金額を2重線で消して、会員割引の金額を記入して頂くとともに，その金額をお支払い頂ければ結構です。

連絡先：東北大学大学院工学研究科
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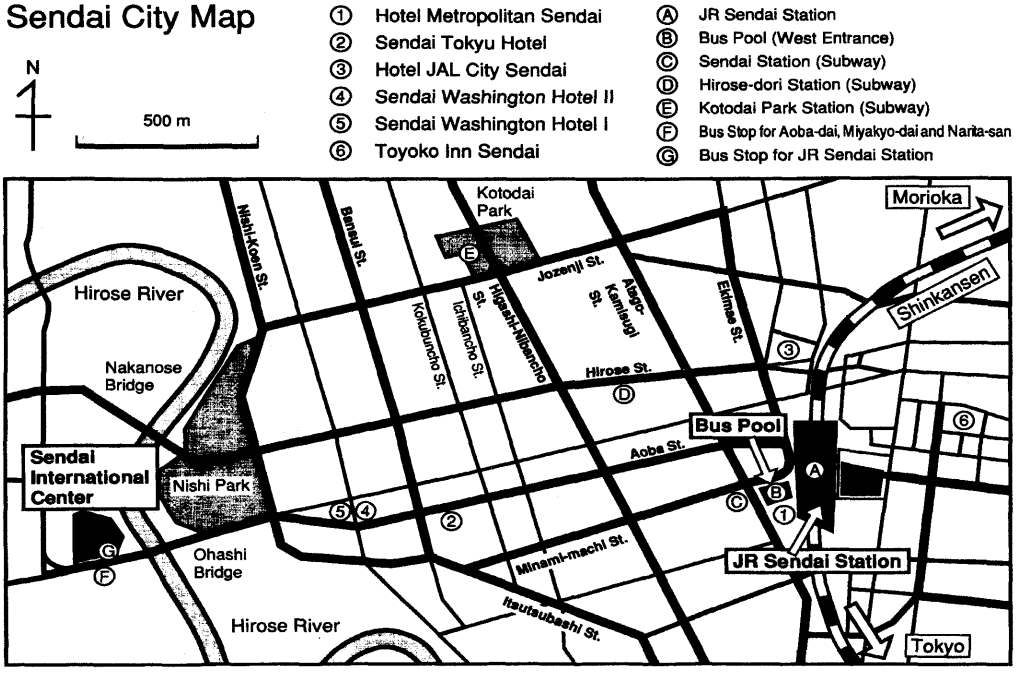
Sendai City Map



HOTEL ACCOMMODATIONS

Nippon Travel Agency has reserved certain number of rooms at the following hotels in the downtown area of Sendai from August 5 to August 9 (5 nights). Reservations will be made on a first come-first serve basis. If your requested hotel is fully booked, reservations will be made at another hotel. **Hotel accommodations may not be accepted after June 1, 2000.**

Due to the Sendai Tanabata Festival, it is extremely difficult to make hotel reservations during the symposium period; The organizers of ZMPC2000 strongly recommend that you make hotel reservations through the ZMPC desk of Nippon Travel Agency.

Code	Hotel Name	Access to ① JR Sendai Station ② Symposium Site	Room Type	Size (m^2)	Rate*
1	**Hotel Metropolitan Sendai**				
	Tel :+81-22-268-2525	① Adjacent to Sendai Station	Single	16	JPY 13,000
	Fax :+81-22-268-2521	② 40 min. on foot or 15 min. by taxi	Twin	25	JPY 18,500
2	**Sendai Tokyu Hotel**				
	Tel :+81-22-262-2411	① 20 min. on foot	Single	17	JPY 12,000
	Fax :+81-22-262-4109	② 20 min. on foot	Twin	22	JPY 16,500
3	**Hotel JAL City Sendai**				
	Tel :+81-22-711-2580	① 5 min. on foot	Single	16	JPY 10,500
	Fax :+81-22-221-5533	② 45 min. on foot or 15 min. by taxi			
4	**Sendai Washington Hotel II**				
	Tel :+81-22-222-2111	① 25 min. on foot	Single	12	JPY 9,000
	Fax :+81-22-262-8752	② 15 min. on foot	Twin	17	JPY 16,500
5	**Sendai Washington Hotel I**				
	Tel :+81-22-222-2111	① 25 min. on foot	Single	11	JPY 7,500
	Fax :+81-22-222-2797	② 15 min. on foot			
6	**Toyoko Inn Sendai**				
	Tel :+81-22-256-1045	① 10 min. on foot	Single	13.5	JPY 7,500
	Fax :+81-22-293-2045	② 50 min. on foot or 25 min. by taxi	Twin	13.5	JPY 9,500

*Room rates include 10% service charge and taxes. Meals are not included.

Access from the JR Sendai Station to the Symposium Site:

At the Bus Stop #9 in the bus pool, JR Sendai Station Nishiguchi (West Entrance), take a bus for "Aoba-dai W8-3", "Miyakyo-dai W8-2", or "Narita-san W8-4". Get off the bus at "Hakubutsu-kan Kokusai-senta (International Center) mae".

Approx. 20 min./JPY 180

During the symposium period, heavy traffic condition may cause some delay due to the Sendai Tanabata Festival.

最近の公開特許から

国内特許

【公開】

11-247073: 不織布機材，複合材料，人工皮革および表皮材（東レ）

11-247157: 耐水性客土吹付材を用いた湛水法面の緑化方法（イビデングリーンテック，乙益正隆，日特建設，マキノグリーン）

11-247415: 畳縁（高田織物）

11-248298: 冷凍サイクル（松下電器産業）

11-248389: 全熱交換素子及び全熱交換器（シャープ）

11-248845: 放射線検出装置（セイコー電子工業）

11-249308: フォトレジスト組成物を調整する方法（シップリィ CO エル エル シー）

11-253536: 菌処理装置（東北鈑金塗装工業）

11-253736: 低温蒸留の前に吸着により空気を精製する方法（レール リクイッド SA プール レチュード エ レクスプロワタシオン デ プロセデ ジョルジュ クロード）

11-253758: 排気ガス浄化用触媒及び排気ガス浄化方法（日産自動車）

11-253800: ガス有害成分除去用触媒及びその触媒を用いたガスの処理方法（石川島播磨重工業）

11-253807: 低級オレフィン製造用触媒（工業技術院長，日本化学工業協会，出光石油化学，東燃化学，日本石油化学，丸善石油化学）

11-253808: 重油接触熱分解プロセスのためのピラー状クレー触媒およびその調製方法（中国石油化工集団公司，中国石油化工総公司石油化工科学研究院）

11-253809: 芳香族アルキル化用のGa-βゼオライト触媒（旭化成工業）

11-253810: 触媒と吸着剤との再生方法（アンスチ. フランセ デュ ペトロール）

11-253931: 浄化剤及びそれを用いた浄水装置（シャープ）

11-255677: パラキシレンの製造方法（帝人）

11-255706: トリメチルハイドロキノンの製造方法（日本石油化学）

11-255819: カチオン重合の反応溶媒精製方法（鐘淵化学工業）

11-255836: 水溶性ポリカルボン酸（塩）粉体の製造方法（日本触媒化学工業）

11-256160: 土壌浸透剤（ティエス植物研究所，第一工業製薬）

11-257573: 真空断熱材（住友化学工業）

11-260256: アパーチャマスクの保存方法（三菱瓦斯化学）

11-260416: リチウム二次電池（日本碍子）

11-262514: 重炭酸塩含有薬液容器包装体及び炭酸ガス分圧コントロール剤（大塚製薬工場）

11-262614: フィルター部材，およびこれを用いたフィルター（日本ピラー工業）

11-262642: 多孔質ガラス膜（住友電気工業）

11-262759: 光触媒を用いた水処理装置および水処理方法（三菱電機）

11-262780: 有機ハロゲン化合物の分解処理方法（栗田工業）

11-262789: 廃有機物系の生物学的処理方法（生物環境システム工学研究所）

11-262790: 浄化処理法，浄化処理材および浄化処理材の再生方法（日本バイリーン）

11-263085: 親展ハガキ用紙（王子製紙）

11-263604: オゾン発生装置（三菱電機）

11-263615: 有機無機複合体，コーティング材，コーティング被膜およびコーティング方法（中国塗料）

11-263616: 形態転写材の製造方法（豊田中央研究所）

11-263617: 高純度ゼオライト及びその製造方法（太平洋炭鉱）

11-263629: 抗菌性結晶化ガラス物品（日本電気硝子）

11-263660: 吹付けコンクリート用セメント組成物（三菱金属）

11-263682: 球面状ゼオライト粒体及びその製造方法（太平洋炭鉱）

11-263738: コバルト錯体触媒を用いるアルカンの酸化生成物の製造方法（工業技術院長，大陽東洋酸素，日本酸素）

11-263876: 有機無機複合体，それを用いたハイブリッド材料，およびそれらの製造方法（東洋紡績）

11-263983: オレフィンの製造（フィナ リサーチ SA）

11-263985: 電気絶縁油の製造法（ジャパンエナジー）
11-263986: 電気絶縁油の製造方法（ジャパンエナジー）
11-264349: 蒸発燃料の蒸散抑止装置（日本電装）
11-264500: 気体化合物の貯蔵と送出のシステム（アドバンスド テクノロジー マテリアルズ INC）
11-266796: 抗菌用飼料添加剤及び該抗菌用飼料添加剤を用いた抗菌方法（全肥商事，富士化学，盛田茂之）
11-267460: 窒素酸化物除去触媒および窒素酸化物除去方法（新エイシーイー，三井金属鉱業）
11-267510: オレフィン変換のための触媒の製造（フィナ リサーチ SA）
11-267511: 改良ゼオライト・ベータを含む触媒による芳香物のアルキル化（ユーオーピー）
11-267512: 排気ガス浄化用触媒（本田技研工業）
11-268401: インクジェット印刷用受容材料（積水化学工業）
11-268909: 耐水溶性球状無機多孔体（旭化成工業）
11-268983: 植物育成用造粒物およびその製造方法（大阪瓦斯）
11-268985: 複合型土壌改良材（宇部興産）
11-269021: 虫避け・脱臭剤（日本動物薬品）
11-269113: ビスフェノールFの製造方法（新日鉄化学）
11-269114: ビスフェノール類の製造方法（出光石油化学）
11-269163: クロモン類の製造法（花王）
11-269295: 発泡用塩素化塩化ビニル系樹脂組成物（徳山積水工業）
11-269494: 洗浄剤組成物（花王）
11-271261: 固体電解質型炭酸ガスセンサ素子（徳山曹達）
11-271994: 電子写真感光体及び電子写真複写装置（リコー）
11-273615: 大気圧イオン化質量分析方法および装置（日立東京エレクトロニクス）
11-273932: 有色磁性粉体及び真性品判定方法（資生堂）
11-276562: 吸着触媒複合シート（三菱製紙）
11-276566: 脱臭材の製造法（ニチアス）
11-276862: 有機化合物の酸化方法およびアルデヒド酸化用触媒（大阪瓦斯）
11-276883: 塩化水素吸着剤とその製造・再生方法及び塩化水素除去方法（明電舎）
11-276884: 吸着剤及びその製造方法，その吸着剤を用いた吸着シート，吸着素子及び有機ガス処理装置（西部技研）
11-276889: 気相吸着用ピッチ系繊維状活性炭（ユニチカ，大阪瓦斯）
11-276896: 排気ガス浄化用触媒及びその製造方法（マツダ）
11-276898: 排気ガス浄化触媒（次世代排ガス触媒研究所）
11-276899: 排気ガス浄化触媒（次世代排ガス触媒研究所）
11-276906: 通気性光触媒シート及びその使用方法（日東電工）
11-276907: 排気ガス浄化用触媒及びその製造方法（日産自動車）
11-276993: 構造物の自己浄化，及び簡易浄化方法（エスケイティ）
11-277729: 記録媒体及びインクジェット記録方法（キャノン）
11-277885: 記録媒体及びインクジェット記録方法（キャノン）
11-278803: 水素リッチガスを製造する方法（ハルドール トプサー AS）
11-278820: 可とう性黒鉛シート及びシート状複合材料（日立化成工業）
11-278827: 無機多孔性材料を含んだ組成物及び触媒組成物並びに無機多孔性材料の製造方法（インテベップ SA）
11-279089: エステルの脱アセチル化方法及び脱ホルミル化方法並びに脱アセチル化用触媒及び脱ホルミル化用触媒（工業技術院長）
11-279121: β-アルコキシプロピオン酸アルキル類の製造法（出光石油化学）
11-279126: アリールエステルの製造方法とこの方法に用いる触媒（日本触媒化学工業）
11-279144: ε-カプロラクタムの製造方法（宇部興産）
11-279145: N-アルケニルカルボキシアミドの製造方法（ベー アー エス エフ AG）
11-279214: 懸濁方法または気相方法における共

役ジエン類のイオン重合および共役ジエン類とさらなるモノマー類の共重合で用いるに適した新規な支持型重合開始系（バイエル AG）

11-279432: 合成フッ素金雲母粉末を用いた着色剤，およびそれを配合した化粧料（資生堂，トピー工業）

11-279941: 液体セラミックの加工法及びその繊維製品（岩井光三郎）

11-280453: ディーゼルエンジンの排気浄化装置（日産自動車）

11-281245: 真空断熱材（シャープ）

11-281539: ガス導入装置およびガス分析装置（日立東京エレクトロニクス）

11-281540: ダイオキシン類の採取装置（三浦工業）

11-285519: 医療用容器（新素材総合研究所）

11-285616: 重質油の軽質化・排煙処理装置及びその方法（明電舎）

11-285625: 触媒分離膜，触媒反応方法および化合物の製造方法（東レ）

11-285632: オゾン吸着剤，オゾン吸着用成形体及びその製造方法（三菱重工業）

11-285640: 排気ガス浄化用触媒の製造法（次世代排ガス触媒研究所）

11-285643: 光触媒脱臭体および光触媒脱臭装置（松下精工）

11-286429: 芳香剤（資生堂）

11-286430: 芳香剤（資生堂）

11-286431: 芳香剤（資生堂）

11-286458: 光学活性体の製造方法（東レ）

11-286460: 芳香族アルキル化方法（フィナ テクノロジー INC）

11-286482: γ-ブチロラクトンの精製方法（東燃）

11-286556: 抗菌性成形物の製造方法（徳山曹達）

11-286668: 水系接着剤組成物（イーテック）

11-286831: 抗菌性ポリアミド繊維及びその製造方法（ユニチカ）

11-287015: 建材（西川仙道）

11-287779: ガス検知素子及びその生産方法（新コスモス電機）

11-288707: 電気化学的不活性粒子を含有するプライマー材料および電池用電極ならびにそれらの製造方法（三菱化成）

11-290411: 入浴用健康補助具および遠赤外線セラミックボール（鳥取セラミックス）

11-290434: 消臭フィルター（太平洋炭鉱）

11-290435: 電波吸収遮蔽と空気浄化組成物（条野哲央）

11-290635: ガス流れから二酸化炭素を除去する方法（ビー オー シー グループ INC）

11-290638: 吸着手段（明電舎）

11-290680: 不均質交換率を有する吸着剤およびその様な吸着剤を用いるPSA法（レール リクィッド SA プール レチュード エ レスクプロワタシオン デ プロセデ ジョルジュ クロード）

11-290686: 排気ガス浄化用触媒（日産自動車）

11-290687: 炭化水素油の水素化分解触媒および水素化分解方法（日本石油）

11-290697: 光触媒酸化チタン，および光触媒脱臭体，および光触媒脱臭，環境浄化装置（松下精工）

11-290867: ビタミンC含有セラミックス及びその製造方法（ナカドイ理研）

11-292509: 酸素の製造方法（日本鋼管）

11-292510: 酸素の製造方法（日本鋼管）

11-292512: オゾンの貯蔵方法及びその装置（三菱重工業）

11-292513: 高濃度オゾンガスの製造方法及びその装置（三菱重工業）

11-292514: 高濃度オゾンガスの製造方法及びその装置（三菱重工業）

11-292530: 合成含鉄膨潤性ケイ酸塩およびその製造方法（工業技術院長）

11-292651: ゼオライト化多孔質体及びその製造方法（日本車両製造，逸見彰男）

11-292728: 化粧料（花王）

11-292729: 化粧料の製造方法（花王）

11-292730: 化粧料（花王）

11-292814: ビフェノール類の製造方法（大日本インキ化学工業）

11-292831: N-アルキルアミン類の製造方法およびこれに用いる触媒（日本触媒化学工業）

11-292864: オレフィン系エポキシドの製造方法（エニーヘム SPA）

11-292962: 芳香族ポリカーボナートの製造方法（工業技術院長）

11-293030: 脂環式構造含有重合体樹脂成形体の再利用方法（日本ゼオン）

11-293033: 有機無機複合体組成物およびそれを用いたハイブリット材料（東洋紡績）
11-293250: 活性土壌の製造方法（ウェック）
11-293290: 粒状ノニオン洗剤組成物の製造方法（ライオン）
11-294743: 家畜糞尿焼却煙の脱臭・脱色処理方法及び装置（亀井三郎，熊本福也）
11-300165: 排気ガスの後処理装置および後処理方法（住友電気工業）
11-300200: ゼオライト鉱石からなる吸着濾材（太平洋炭鉱）
11-300204: ポリオレフィンの熱分解油化用触媒，その製造方法及びその利用（日本化学繊維検査協会）
11-300208: 接触分解触媒（出光興産，石油産業活性化センター）
11-300209: 排ガス浄化触媒，その製造方法及び排ガス浄化方法（東ソー）
11-300210: 炭化水素流動接触分解用触媒組成物（触媒化成工業）
11-300211: 排気ガス浄化用触媒及び排気ガス浄化方法（日産自動車）
11-302012: 古紙由来の人工ゼオライト原料および古紙由来の人工ゼオライト（逸見彰男，坂上越朗）
11-309329: 硫黄化合物除去方法およびそれに用いる吸着剤の再生方法（松下電器産業）
11-309365: 分散体（花王）
11-309370: 低シリカX型ゼオライトの成形焼成物，および，リチウム交換低シリカX型ゼオライト成形焼成物の吸着剤（東ソー）
11-309371: 硫黄化合物吸着体および硫黄化合物除去方法（松下電器産業）
11-309376: 排ガス浄化用触媒及びその製造方法（トヨタ自動車）
11-309378: オレフィンの酸化用触媒（旭化成工業，野口研究所）
11-314037: ゼオライトNU-85，NU-86及びNU-87から成るグループの中から選択されたゼオライトを含む触媒，及び炭化水素石油供給原料の水素化変換率におけるその使用（アンスチ．フランセ デュ ペトロール）
11-314912: アルミニウムスラッジからゼオライトを製造する方法（吉沢石灰工業）
11-314913: 高強度低摩耗性ゼオライト粒状物及びその製造方法（東ソー）
11-315047: 固体酸触媒による第三級カルボン酸の合成法（工業技術院長）
11-315075: 2-アルケニル-1，3-ジオキソ化合物の製造方法（日本触媒化学工業）
11-315287: 少なくとも1つのゼオライトNU-85，NU-86またはNU-87を含む触媒の存在下での炭化水素石油仕込物の水素化クラッキング方法（アンスチ．フランセ デュ ペトロール）
11-319490: 脱硝装置の制御方法（明電舎）
11-319551: 炭化水素の吸着剤及び炭化水素の吸着除去方法（東ソー）
11-319554: 粒状触媒用担体及びこの担体を用いた触媒及び該触媒による炭化水素油の水素化処理方法（日本ケッチェン）
11-319560: 排気ガス浄化用触媒（マツダ）
11-319563: 排気ガス浄化用触媒（マツダ）
11-319568: アシル基置換芳香族化合物製造用触媒およびアシル基置換芳香族化合物の製造方法（東レ）
11-319569: 触媒およびその触媒を用いたアシル基置換芳香族化合物の製造方法（東レ）
11-319570: 複合光触媒（ダイキン工業）
11-319571: ガス浄化触媒及びガス浄化方法（東ソー）
11-319572: ガス浄化触媒およびガス浄化方法（東ソー）
11-319573: ハロゲン化芳香族化合物の異性化触媒組成物および異性化方法（東レ）
11-319584: 粒状触媒用担体の製造方法および該担体を用いた触媒の製造方法（日本ケッチェン）
11-322326: 低シリカフォージャサイト型ゼオライトの製造方法（東ソー）
11-322525: ゼオライト系抗菌剤及び樹脂組成物（日本化学工業，耕正）
11-322640: 2，6-ジメチルナフタレンの製造法（エニーヘム SPA，エニテクノロジー SPA）
11-322681: ジアルカノールアミンの製造方法およびこれに用いる触媒（日本触媒化学工業）
11-324663: 排気ガス浄化用触媒（マツダ）
11-333226: 空気浄化フィルタ及びその製造方法及び高度清浄装置（高砂熱学工業）
11-333238: 機能性パネル（松下冷機）
11-335116: 有機無機複合体，それを用いたハイブ

リッド材料，およびそれらの製造方法（東洋紡績）
11-335117: 冷凍サイクル用乾燥剤及びその製造方法（東ソー）
11-335305: 光学活性体のラセミ化方法およびラセミ化触媒（東レ）
11-335308: ジクロロベンゼン異性体の分離方法（東レ）

【公表】

11-510529: ポリオキシテトラメチレングリコールの製造方法（ベー アー エス エフ AG）
11-510731: 触媒の使用（シェル INTERN リサーチ マーチャッピー BV）
11-511058: 複式フィルタユニット（クルト リンデ コンスルト ウント フェルバルトニングス AB）
11-511072: 形状選択性ゼオライト触媒及び芳香族化合物の変換でのその使用（モービル オイル CORP）
11-511111: シリカに富む活性マザイト並びに該マザイトの製造方法及び適用（エルフ アキテーヌ）
11-511158: ボロンBETAゼオライトの存在下にオレフィンからアミンを製造する方法（ベー アー エス エフ AG）
11-511176: 1，4-ブテンジオールの製造方法（イーストマン CHEM CO）
11-511227: 内燃機関の排気を浄化する方法および装置（トヨタ自動車）
11-511685: モレキュラーシーブおよびその製造法（エクソン CHEM パテンツ INC）
11-511720: 小さい中性アミンを用いたMTT結晶構造を有するゼオライトの製造方法（シェブロン ユー エスー エー INC）
11-512119: ポリカルボン酸塩を用いた洗濯方法（バイエル AG）
11-512483: ゼオライトを含有した高効率デリバリーシステム（プロクター アンド ギャンブル CO）
11-512696: 合成多孔質結晶MCM-61，その合成及び使用（モービル オイル CORP）
11-512943: 物理的に極めて近接したゼオライトとシリカの臭気制御系を有する吸収製品（プロクター アンド ギャンブル CO）
11-512945: シリカに基づく臭気制御システムを有する通気性吸収製品（プロクター アンド ギャンブル CO）
11-512946: ゼオライトとシリカの防臭システムを有する婦人用衛生吸収性製品（プロクター アンド ギャンブル CO）
11-513662: アルミノケイ酸塩及びシリカのポロシティーの変性方法及びそれから誘導された中間細孔質組成体（ダウ CHEM CO）
11-513969: 分子篩錯体化合物の製造方法（コリア リサーチ INST オブ CHEM テクノロジー）
11-514282: 窒素酸化物還元用触媒および排ガス中の窒素酸化物を還元する方法（大阪瓦斯，エニリチェルチェ SPA）

【再公表】

10-833850: 熱可塑性エラストマー組成物，熱可塑性エラストマー組成物パウダー及びそれらよりなる表皮材（東ソー，仲田コーティング）

US Patent

NUCLEAR POLARIZATION ENHANCED NUCLEAR MAGNETIC RESONANCE IMAAGING, ASSIGNEE(s): Nycomed Imaging AS (NO), PATENT NO.: 6,008,644 (19991228), FILED:(19970703)

TOTAL ISOMERIZATION PROCESS WITH ENHANCED HEAT INTEGRATION, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,008,427 (19991228), FILED:(19980504)

PROCESS FOR CATALYTIC CONVERSION OF OLEFINS, ASSIGNEE(s): Exxon Chemical Patents Inc, PATENT NO.: 6,008,426 (19991228), FILED: (19980602)

PROCESS FOR ISOMERIZATION OF ALKYLAROMATIC HYDROCARBONS, ASSIGNEE(s): Exxon Chemical Patents Inc, PATENT NO.: 6,008,425 (19991228), FILED: (19970529)

C8 ALKYLAROMATIC HYDROCARBON PRODUCTION USING REVERSIBLE FLOW REACTIVE CHROMATOGRAPHY, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,008,424 (19991228), FILED: (19981019)

SELECTIVE AROMATICS DISPROPORTIONATION/TRANS-ALKYLATION, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,008,423 (19991228), FILED: (19971208)

ALKYLATION PROCESS USING INTERBED RECYCLING OF COOLED REACTOR EFFLUENT, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,008,422 (19991228), FILED: (19980707)

PRODUCTION OF MIBK USING CATALYTIC DISTILLATION TECHNOLOGY, ASSIGNEE(s): Catalytic Distillation Technologies, PATENT NO.: 6,008,416 (19991228), FILED: (19980616

PROCESS FOR PREPARING ORGANIC CARBONATES, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 6,008,399 (19991228), FILED: (19990311)

IRIDIUM-DIPHOSPINE COMPLEXES AND PROCESS FOR THE HYDROGENATION OF IMINES, ASSIGNEE(s): Novartis AG (CH), PATENT NO.: 6,008,393 (19991228), FILED: (19980122)

OXIDATION CATALYST AND PROCESS FOR THE PRODUCTION OF EPOXIDES FROM OLEFINES, HYDROGEN AND OXYGEN USING SAID OXIDATION CATALYST, ASSIGNEE(s): BASF Aktiengesellschaft (DE), PATENT NO.: 6,008,389 (19991228), FILED: (19981214)

EPOXIDATION PROCESS, ASSIGNEE(s): ARCO Chemical Technology, L P, PATENT NO.: 6,008,388 (19991228), FILED: (19990412)

FUNCTIONALIZED POLYAMINES, ASSIGNEE(s): National Starch and Chemical Investment Holding Corporation, PATENT NO.: 6,008,316 (19991228), FILED: (19980903)

AROMATIC POLYCARBODIIMIDE AND FILM THEREOF, ASSIGNEE(s): Nitto Denko Corporation (JP), PATENT NO.: 6,008,311 (19991228), FILED: (19980205)

MID-CHAIN BRANCHED ALKOXYLATED SULFATE SURFACTANTS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 6,008,181 (19991228), FILED: (19981013)

DETERGEN COMPOSITION COMPRISING CATIONIC ESTER SURFACTANT AND PROTEASE ENZYME, ASSIGNEE(s): Procter & Gamble Company, PATENT NO.: 6,008,178 (19991228), FILED: (19971222)

USE OF GLYCINE-N, N-DIACETIC ACID DERIVATIVES AS BIODEGRADABLE COMPLEXING AGENTS FOR ALKALINE EARTH METAL IONS AND HEAVY METAL IONS, ASSIGNEE(s): BASF Aktiengesellschaft (DE), PATENT NO.: 6,008,176 (19991228), FILED: (19980506)

POWDER DETERGENT COMPOSITION HAVING IMPROVED SOLUBILITY, ASSIGNEE(s): Amway Corporation, PATENT NO.: 6,008,174 (19991228), FILED: (19971023)

HEAT SENSITIVE COLOR DEVELOPING MATERIAL AND HEAT SENSITIVE ELEMENT USING THE SAME, ASSIGNEE(s): Matsushita Electric Industrial Co Ltd (JP), PATENT NO.: 6,008,156 (19991228), FILED: (19971205)

EXHAUST EMISSION CONTROL CATALYST AND PROCESS FOR PRODUCING THE SAME, ASSIGNEE(s): Honda Giken Kogyo Kabushiki Kaisha (JP), PATENT NO.: 6,008,155 (19991228), FILED: (19970828)

PYRIMIDINE DERIVATIVES FOR LABELED BINDING PARTNERS, ASSIGNEE(s): Gilead Sciences, Inc, PATENT NO.: 6,007,992 (19991228), FILED: (19971110)

OXYGEN SCAVENGING COMPOSITIONS AND METHODS FOR MAKING SAME, ASSIGNEE(s): W R Grace & Co -Conn , PATENT NO.: 6,007,885 (19991228), FILED: (19980319)

FAMILY OF MICROPOROUS INDIUM SILICATE COMPOSITIONS, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,007,790 (19991228), FILED: (19980813)

COUNTERCURRENT REACTION VESSEL, ASSIGNEE(s): Exxon Research and Engineering Co , PATENT NO.: 6,007,787 (19991228), FILED: (19960823)

METHOD FOR TREATING A LIQUID STREAM CONTAMINATED WITH AN IODINE-CONTAINING COMPOUND USING A SOLID ABSORBENT COMPRISING A METAL PHTHALOCYANINE, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,007,724 (19991228), FILED: (19981221)

PROCESS FOR THE PRODUCTION OF CATALYTIC CRACKING GASOLINE WITH A LOW SULPHUR CONTENT, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 6,007,704 (19991228), FILED: (19970923)

MULTI-STEP PROCESS FOR CONVERSION OF A PETROLEUM RESIDUE, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 6,007,703 (19991228), FILED: (19971001)

PROCESS FOR CRACKING HYDROCARBON FEEDS USING A CATALYST COMPRISING AN IM-5 ZEOLITE WHICH IS OPTIONALLY DEALUMINATED, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 6,007,698 (19991228), FILED: (19980126)

WATER-SWELLABLE COMPOSITIONS AND SEALANTS, ASSIGNEE(s): Kunimine Industries Co Ltd (JP), PATENT NO.: 6,007,615 (19991228), FILED: (19980408)

PRESSURIZED CONTAINER WITH RESTRICTOR TUBE HAVING MULTIPLE CAPILLARY PASSAGES, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,007,609 (19991228), FILED: (19971218)

PSA PROCESS AND SYSTEM, ASSIGNEE(s): Praxair Technology, Inc, PATENT NO.: 6,007,606 (19991228), FILED: (19971209)

EXHAUST DENITRATION DEVICE FOR DIESEL ENGINE, ASSIGNEE(s): Komatsu Ltd (JP), PATENT NO.: 6,006,515 (19991228), FILED: (19970519)

JACKET FOR INSULATED ELECTRIC CABLE, ASSIGNEE(s): University of Connecticut, PATENT NO.: 6,005,192 (19991221), FILED: (19950804)

MODIFICATION OF MOLECULAR SIEVE CATALYST FOR REDUCED METHANE PRODUCTION DURING CONVERSION OF OXYGENATES TO OLEFINS, ASSIGNEE(s): Exxon Chemicals Patents Inc, PATENT NO.: 6,005,155 (19991221), FILED: (19971203)

ISOMERIZATION PROCESS USING ZEOLITE SSZ-25, ASSIGNEE(s): Chevron USA Inc, PATENT NO.: 6,005,154 (19991221), FILED: (19970807)

PROCESS FOR AROMATIC TRANSALKYLATION USING SIMULATED MOVING BED REACTIVE CHROMATOGRAPHY, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,005,153 (19991221), FILED: (19981019)

PROCESS FOR THE PREPARATION OF MONOALKYLATED AROMATIC COMPOUNDS, ASSIGNEE(s): Enichem S p A, EniTechnologie S p A (IT), PATENT NO.: 6,005,152 (19991221), FILED: (19990405)

PROCESS FOR THE PRODUCTION OF BUTENE-1 FROM A MIXTURE OF C4 OLEFINS, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,005,150 (19991221), FILED: (19980622)

MULTI-FUNCTIONAL, CYCLIC ORGANOSILOXANES, PROCESS FOR THE PRODUCTION THEREOF AND USE THEREOF, ASSIGNEE(s): Bayer Aktiengesellschaft (DE), PATENT NO.: 6,005,131 (19991221), FILED: (19970904)

EPOXIDATION PROCESS, ASSIGNEE(s): Arco Chemical Technology, L P , PATENT NO.: 6,005,123 (19991221), FILED: (19990412)

POLYETHYLENE COMPATIBLE SULPHONIC ACIDS AS SILANE CROSSLINKING CATALYSTS, ASSIGNEE(s): Borealis Holding A/S (DK), PATENT NO.: 6,005,055 (19991221), FILED: (19960730)

PROPYLENE-ETHYLENE COPOLYMER COMPOSITION AND PROCESS FOR PRODUCING THE SAME, ASSIGNEE(s): Chisso Corpoation, Toyota Jidosha Kabushiki Kaisha (JP), PATENT NO.: 6,005,034 (19991221), FILED: (19970430)

FATTY ACID DERIVATIVES AND THEIR USE AS SURFACTANTS IN DETERGENTS AND CLEANERS, ASSIGNEE(s): BASF Aktiengesellschaft (DE), PATENT NO.: 6,004,923 (19991221), FILED: (19980427)

LAUNDRY DETERGENT COMPOSITIONS COMPRISING CATIONIC SURFACTANTS AND MODIFIED POLYAMINE SOIL DISPERSENTS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 6,004,922 (19991221), FILED: (19981103)

PROCESS FOR MAKING GRANULAR SUDS SUPPRESSING COMPONENT, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 6,004,921 (19991221), FILED: (19981002)

PROCESS FOR THE PRODUCTION OF LIQUID COMPOSITIONS, ASSIGNEE(s): Lever Brothers Company, PATENT NO.: 6,004,917 (19991221), FILED: (19951222)

ALKALINE EARTH METAL CONTAINING SMALL PORE NON-ZEOLITIC MOLECULAR SIEVE CATALYSTS, ASSIGNEE(s): Exxon Chemicals Patent Inc, PATENT NO.: 6,004,898 (19991221), FILED: (19980915)

HYDROCARBON ADSORBERS, METHOD OF MAKING AND USE THEREFOR, ASSIGNEE(s): Corning Incorporated, PATENT NO.: 6,004,896 (19991221), FILED: (19980504)

HEAT-RESISTING MATERIAL, ASSIGNEE(s): Mitsubishi Chemical Corporation, Nippon Pillar Packing Co Ltd (JP), PATENT NO.: 6,004,890 (19991221), FILED: (19980512)

OXYGENASE EXPRESSING MICROORGANISM STRAIN JM1 (FERM BP-5352) FOR DEGRADING ORGANIC COMPOUNDS WITHOUT AN INDUCER, ASSIGNEE(s): Canon Kabushiki Kaisha (JP), PATENT NO.: 6,004,772 (19991221), FILED: (19960228)

NONAQUEOUS SECONDARY BATTERY, ASSIGNEE(s): Fuji Photo Film Co Ltd (JP), PATENT NO.: 6,004,695 (19991221), FILED: (19970929)

LOW TEMPERATURE MELT INJECTED ANTI-MICROBIAL FILMS, ARTICLES CONTAINING SUCH FILMS AND METHODS OF MANUFACTURE AND USE THEREOF, ASSIGNEE(s): ShinShu Ceramics Company, Ltd (JP), PATENT NO.: 6,004,667 (19991221), FILED: (19940630)

FILM HAVING FINE VOIDS AND MANUFACTURE THEREOF, ASSIGNEE(s): Toyo Boseki Kabushiki Kaisha (JP), PATENT NO.: 6,004,664 (19991221), FILED: (19980706)

COMBINATORIAL SYNTHESIS OF NOVEL MATERIALS, ASSIGNEE(s): Symyx Technologies; The Regents of the University of California, PATENT NO.: 6,004,617 (19991221), FILED: (19950607)

HIGHLY ABSORBENT BODY POWDERS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 6,004,584 (19991221), FILED: (19980302)

METHOD FOR MAKING MOLECULAR SIEVES AND NOVEL MOLECULAR SIEVE COMPOSITIONS, ASSIGNEE(s): ABB Lummus Global Inc, PATENT NO.: 6,004,527 (19991221), FILED: (19970929)

SOLID FILTRATION MEDIA INCORPORATING ELEVATED LEVELS OF PERMANGANATE AND WATER, ASSIGNEE(s): Purafil, Inc, PATENT NO.: 6,004,522 (19991221), FILED: (19970702)

CATALYST FOR PURIFYING EXHAUST GASES, ASSIGNEE(s): Cataler Industrial Co Ltd, Toyota Jidosha Kabushiki Kaisha (JP), PATENT NO.: 6,004,521 (19991221), FILED: (19960426)

OXYGEN ABSORPTION COMPOSITION, ASSIGNEE(s): Mitsubishi Gas Chemical Company, Inc (JP), PATENT NO.: 6,004,477 (19991221), FILED: (19971008)

SPENT BRINE RECLAMATION, ASSIGNEE(s): Desalination Systems, Inc, PATENT NO.: 6,004,464 (19991221), FILED: (19980714)

PROCESS FOR CONVERTING HYDROCARBON FEED TO HIGH PURITY BENZENE AND HIGH PURITY PARAXYLENE, ASSIGNEE(s): Chevron Chemical Company LLC, PATENT NO.: 6,004,452 (19991221), FILED: (19971114)

FILTRATION DEVICE AND METHOD USING ABSORPTION FOR THE REMOVAL OF GAS PHASE CONTAMINANTS, ASSIGNEE(s): AlliedSignal Inc, PATENT NO.: 6,004,381 (19991221), FILED: (19971023)

OXYGEN ENRICHMENT PROCESS, ASSIGNEE(s): Bayer Aktiengesellschaft (DE), PATENT NO.: 6,004,378 (19991221), FILED: (19920224)

SYSTEM FOR COLLECTING AND REFINING SF6 GAS AND METHOD THEREFOR, ASSIGNEE(s): Hitachi Engineering & Services Co Ltd; Showa Denko K K (JP), PATENT NO.: 6,004,377 (19991221), FILED: (19980616)

CATALYTIC DISTILLATION OLIGOMERIZATION OF VINYL MONOMERS TO MAKE POLYMERIZABLE VINYL MONOMER OLIGOMERS USES THEREOF AND METHODS FOR SAME, INVENTOR(s): Townsend, Phillip; Doughty, Aaron T., PATENT NO.: 6,004,256 (19991221), FILED: (19950526)

METHOD AND APPARATUS FOR COOLING WARM MOISTURE-LADEN AIR, ASSIGNEE(s): ACMA Limited (SG); NovelAir Technologies, L L C (US), PATENT NO.: 6,003,327 (19991221), FILED: (19971104)

ALKYLATION PROCESS USING ZEOLITE BETA, ASSIGNEE(s): Exxon Chemical Patents Inc, PATENT NO.: 6,002,057 (19991214), FILED: (19970905)

FLUORINE-CONTAINING ETHER COMPOUND AND GELLING AGENT CONTAINING THE SAME, ASSIGNEE(s): Kao Corporation (JP), PATENT NO.: 6,002,048 (19991214), FILED: (19980409)

PROCESS FOR THE PRODUCTION OF PETROCHEMICALS, ASSIGNEE(s): The Boc Group, Inc, PATENT NO.: 6,002,019 (19991214), FILED: (19971121)

PYRROLODIAZINE DERIVATIVES AS STABILIZERS FOR CHILORINE-CONTAINING POLYMERS, ASSIGNEE(s): Witco Vinyl Additives GmbH (DE), PATENT NO.: 6,002,004 (19991214), FILED: (19980114)

METHOD FOR SOLUTION PHASE SYNTHESIS OF OLIGONUCLEOTIDES AND PEPTIDES, ASSIGNEE(s): Proligo LLC, PATENT NO.: 6,001,966 (19991214), FILED: (19980806)

AROMATIC POLYCARBODIIMIDE AND FILM THEREOF, ASSIGNEE(s): Nitto Denko Corporation (JP), PATENT NO.: 6,001,951 (19991214), FILED: (19981105)

CROSSLINKABLE SILICONE COMPOUND, STABLE UNDER STORAGE CONDITIONS, ASSIGNEE(s): Zhermack S p A (IT), PATENT NO.: 6,001,914 (19991214), FILED: (19970728)

BIODEGRADABLE ALIPHATIC POLYESTER ELASTOMER AND PREPARATION PROCESS OF SAME, ASSIGNEE(s): Mitsui Chemicals, Inc (JP), PATENT NO.: 6,001,891 (19991214), FILED: (19970529)

PROCESS FOR THE SEPARATION OF PYRIMIDINE DERIVATIVES FROM AQUEOUS SOLUTIONS, ASSIGNEE(s): Degussa-Huls AG (DE), PATENT NO.: 6,001,838 (19991214), FILED: (19980318)

USE OF MODIFIED POLYASPARTIC ACIDS IN WASHING AGENTS, ASSIGNEE(s): BASF Aktiengesellschaft (DE), PATENT NO.: 6,001,798 (19991214), FILED: (19980304)

PASTE-FORM WASHING-UP AGENT AND ITS MANUFACTURE, ASSIGNEE(s): Henkel Kommanditgesellschaft auf Aktien (DE), PATENT NO.: 6,001,791 (19991214), FILED: (19980203)

MIXED POLYSULFIDES AND LUBRICANTS AND FUNCTIONAL FLUIDS CONTAINING THE SAME, ASSIGNEE(s): The Lubrizol Corporation, PATENT NO.: 6,001,783 (19991214), FILED: (19970324)

SUPPORTED CATALYSTS CONTAINING A PLATINUM METAL AND PROCESS FOR PREPARING DIARYL CARBONATES, ASSIGNEE(s): Bayer Aktiengesellschaft (DE), PATENT NO.: 6,001,768 (19991214), FILED: (19960329)

ASSAYS USING CHEMILUMINESCENT ELECTRON-RICH ARYL-SUBSTITUTED 1,2-DIOXETANES, ASSIGNEE(s): Abbott Laboratories, PATENT NO.: 6,001,659 (19991214), FILED: (19950509)

ENDOGLUCANASES, ASSIGNEE(s): Novo Nordisk A/S (DK), PATENT NO.: 6,001,639 (19991214), FILED:, 1996 (19960521)

INDICATOR REAGENTS FOR ASSAYS USING CHEMILUMINESCENT ELECTRON-RICH ARYL SUBSTITUTED 1,2-DIOXETANES, ASSIGNEE(s): Abbott Laboratories, PATENT NO.: 6,001,561 (19991214), FILED: (19950509)

SOLID POLYMER ELECTROLYTES, ASSIGNEE(s): Samsung Display Devices Co Ltd (KR), PATENT NO.: 6,001,509 (19991214), FILED: (19971118)

INK JET RECEPTOR ELEMENT HAVING A PROTECTIVE LAYER, ASSIGNEE(s): Rexam Graphics, Inc , PATENT NO.: 6,001,482 (19991214), FILED: 1997 (19970804)

INSULATED ASSEMBLY INCORPORATING A THERMOPLASTIC BARRIER MEMBER, INVENTOR(s): Lafond, Luc, PATENT NO.: 6,001,453 (19991214), FILED: (19971124)

COMBINATIONS OF PEROXIDE LIPIDS AND ORGANOSILICON COMPOUNDS, COSMETIC AND DERMATOLOGICAL COMPOSITIONS CONTAINING SAME, AND USES THEREOF, IN PARTICULAR FOR TREATING ALOPECIA, ASSIGNEE(s): Laboratoires Carilene (FR), PATENT NO.: 6,001,378 (19991214), FILED: (19980724)

UNCOMPLEXED CYCLODEXTRIN COMPOSITIONS FOR ODOR AND WRINKLE CONTROL, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 6,001,343 (19991214), FILED: (19980427)

CRYSTALLINE METALLOPHOSPHATES, ASSIGNEE(s): Norsk Hydro ASA (NR), PATENT NO.: 6,001,328 (19991214), FILED: (19990414)

PROCESS FOR REMOVING ACIDS FROM LITHIUM SALT SOLUTIONS, ASSIGNEE(s): FMC Corporation, PATENT NO.: 6,001,325 (19991214), FILED: (19970609)

METHOD OF ADSORBING HYDROCARBONS, ASSIGNEE(s): Corning Incorporated, PATENT NO.: 6,001,320 (19991214), FILED: (19971219)

PROCESS FOR LOWERING NITROGEN OXIDE LEVELS IN COMBUSTION ENGINE EXHAUST GAS, ASSIGNEE(s): Degussa-Huls Aktiengesellschaft (DE), PATENT NO.: 6,001,318 (19991214), FILED: (19971222)

METHOD FOR REMOVING ORGANIC CONSTITUENTS FROM AN AQUEOUS STREAM, ASSIGNEE(s): Nederlandse Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek (TNO) (NL), PATENT NO.: 6,001,258 (19991214), FILED: (19971117)

LIQUID SEPARATION BY ZEOLITE MEMBRANES, INVENTOR(s): Bratton, Graham J; Buck, Karon D; De Villiers Naylor, Timothy (GB), PATENT NO.: 6,001,257 (19991214), FILED: (19970522)

BTX FROM NAPHTHA WITHOUT EXTRACTION, ASSIGNEE(s): UOP LLC, PATENT NO.: 6,001,241 (19991214), FILED: (19980810)

ROTARY DISTRIBUTION VALVE, AND REGENERATIVE COMBUSTION APPARATUS AND REGENERATIVE HEAT EXCHANGER USING SAME, ASSIGNEE(s): Daikin Industries, Ltd (JP), PATENT NO.: 6,000,929 (19991214), FILED: (19960220)

CHANGE GEAR CONTROL DEVICE USING ACCELERATION AND GEAR RATIO AS PARAMETERS FOR AUTOMATIC TRANSMISSION IN A MOTOR VEHICLE AND THE METHOD THEREFOR, ASSIGNEE(s): Hitachi, Ltd (JP), PATENT NO.: 6,000,378 (19991214), FILED: (19980831)

AIR INJECTION STRATEGIES FOR EFFECTIVELY BURNING HYDROCARBONS RELEASED FROM A HYDROCARBON TRAP, ASSIGNEE(s): Engelhard Corporation, PATENT NO.: 6,000,217 (19991214), FILED: (19950104)

METHOD AND PACKAGE FOR PACKAGING CONTENTS AT REDUCED PRESSURES, ASSIGNEE(s): Calgon Carbon Corporation, PATENT NO.: 6,000,198 (19991214), FILED: (19980407)

METHOD FOR HEATING AND COOLING FOOD PRODUCTS, INVENTOR(s): Bussmann, Paulus Josephus Theodorus; Krist-Spit, Catharina Elizabeth (NL), PATENT NO.: 6,000,144 (19991214), FILED: (19980205)

SANITARY ARTICLES WITH MULTI APERTURE SIZE FILM TOPSHEETS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,998,696 (19991207), FILED: (19981002)

XYLENE ISOMERIZATION PROCESS USING TOLUENE CO-FEED, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,998,688 (19991207), FILED: (19980825)

ETHYLBENZENE PROCESS USING STACKED REACTOR LOADING OF BETA AND Y ZEOLITES, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,998,687 (19991207), FILED: (19980729)

PROCESS FOR PRODUCING AROMATIC COMPOUNDS FROM ALIPHATIC HYDROCARBONS, ASSIGNEE(s): Exxon Chemical Patents Inc, PATENT NO.: 5,998,686 (19991207), FILED: (19970529)

PROCESS FOR PREPARING BUTENE OLIGOMERS FROM FIELD BUTANES, ASSIGNEE(s): Huels Aktiengesellschaft (DE), PATENT NO.: 5,998,685 (19991207), FILED: (19970724)

RECOVERY PROCESS FOR WET AROMATIC ALKYLATION AND DRY AROMATIC TRANSALKYLATION, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,998,684 (19991207), FILED: (19971110)

METHODS FOR CONVERTING LOWER ALKANES AND ALKANES TO ALCOHOLS AND DIOLS, ASSIGNEE(s): JLM Technology, Ltd , PATENT NO.: 5,998,679 (19991207), FILED: (19980726)

BROMINE COMPOUND PRODUCTION METHOD, ASSIGNEE(s): Teijin Chemicals, Ltd (JP), PATENT NO.: 5,998,674 (19991207), FILED: (19980821)

CATALYTIC PROCESSES FOR THE PREPARATION OF ACETIC ESTERS, ASSIGNEE(s): Industrial Technology Research Institute (TW), PATENT NO.: 5,998,658 (19991207), FILED: (19980626)

ROSIN-BASED MOLECULAR CRYSTALS, NUCLEATING AGENT FOR POLYOLEFIN AND POLYOLEFIN RESINS COMPOSITION AND MOLDINGS THEREOF, ASSIGNEE(s): New Japan Chemical Co Ltd (JP), PATENT NO.: 5,998,576 (19991207), FILED: (19980408)

ETHYLENE POLYMERS HAVING ENHANCED PROCESSING EASE, ASSIGNEE(s): Union Carbide Chemicals & Plastics Technology Corporation, PATENT NO.: 5,998,558 (19991207), FILED: (19971229)

WATER-DISPERSIBLE BLOCKED ISOCYANATE COMPOSITION, AND WATER-BASE PAINT COMPOSITION AND WATER-BASE ADHESIVE COMPOSITION USING SAME, ASSIGNEE(s): Nippon Polyurethane Industry Co Ltd (JP), PATENT NO.: 5,998,539 (19991207), FILED: (19971007)

THERMOPLASTIC ELASTOMERIC COMPOSITIONS AND FILMS FORMED THEREFROM HAVING IMPROVED MOISTURE VAPOR TRANSMISSION RATES, ASSIGNEE(s): Eastman Chemical Company, PATENT NO.: 5,998,505 (19991207), FILED: (19971120)

ANTIMICROBIAL ACID CLEANER FOR USE ON ORGANIC OR FOOD SOIL, ASSIGNEE(s): Ecolab Inc, PATENT NO.: 5,998,358 (19991207), FILED: (19990323)

NON-SRAY-DRYING PROCESS FOR PREPARING DETERGENT COMPOSITIONS, ASSIGNEE(s): Lever Brothers Company, PATENT NO.: 5,998,357 (19991207), FILED: (19960829)

PROCESS FOR MAKING GRANULAR DETERGENTS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,998,356 (19991207), FILED: (19980312)

DISCRETE WHITENING AGENT PARTICLES METHOD OF MAKING, AND POWDER DETERGENT CONTAINING SAME, ASSIGNEE(s): Amway Corporation, PATENT NO.: 5,998,351 (19991207), FILED: (19980310)

BLEACHING COMPOUNDS COMPRISING N-ACYL CAPROLACTAM AND/OR PEROXY ACID ACTIVATORS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,998,350 (19991207), FILED: (19960906)

AUTOMATIC DISHWASHING TABLETS, ASSIGNEE(s): Colgate Palmolive Company, PATENT NO.: 5,998,345 (19991207), FILED: (19990325)

PYRAZOLE COMPOUNDS, PROCESSES FOR THEIR PRODUCTION AND HERBICIDES CONTAINING THEM, ASSIGNEE(s): Ishihara Sangyo Kaisha Ltd (JP), PATENT NO.: 5,998,334 (19991207), FILED: (19981026)

METHOD OF MAKING ACTIVATED CARBON-SUPPORTED CATALYSTS, ASSIGNEE(s): Corning Incorporated, PATENT NO.: 5,998,328 (19991207), FILED: (19980928)

ENZYME IMMOBILIZATION ON A SILICEOUS SUPPORT WITH A POLYALDEHYDE CROSS-LINKING AGENT, INVENTOR(s): Le Fevre, Gerard N.; Saville, Bradley A.(CA), PATENT NO.: 5,998,183 (19991207), FILED: (19970707)

ZINCOALUMINOSILICATES OF THE FAU STRUCTURE, ASSIGNEE(s): Air Products and Chemicals, Inc , PATENT NO.: 5,997,841 (19991207), FILED: (19970808)

CHIRAL SOLID CATALYST, ITS PREPARATION AND ITS USE FOR THE PRODUCTION OF SUBSTANTIALLY ENANTIOMERICALLY PURE PRODUCTS, ASSIGNEE(s): K V Leuven Research & Development (BE), PATENT NO.: 5,997,840 (19991207), FILED: (19980713)

METHOD OF PURIFYING EXHAUST GAS FROM INTERNAL COMBUSTION ENGINE, ASSIGNEE(s): N E Chemcat Corporation (JP), PATENT NO.: 5,997,830 (19991207), FILED: (19970613)

ENVIRONMENT PURIFYING MATERIAL, ASSIGNEE(s): Hitachi Chemical Company, Ltd (JP), PATENT NO.: 5,997,829 (19991207), FILED: (19971126)

ARTICLE WITH ANTIMICROBIAL COATING, ASSIGNEE(s): Huels Aktiengesellschaft (DE), PATENT NO.: 5,997,815 (19991207), FILED: (19980213)

CARBOXYLIC ACID ESTERS AND COMPOSITION COMPRISING THEM, ASSIGNEE(s): Exxon Chemical Patents Inc, PATENT NO.: 5,997,760 (19991207), FILED: (19970717)

UNCOMPLEXED CYCLODEXTRIN COMPOSITIONS FOR ODOR CONTROL, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,997,759 (19991207), FILED: (19980427)

METHOD FOR PRODUCING HIGH PURITY WATER USING TRIPLE PASS REVERSE OSMOSIS (TPRO), ASSIGNEE(s): Zenon Environmental Inc (CA), PATENT NO.: 5,997,745 (19991207), FILED: (19980408)

SILICONIZED ACID-TREATED ZEOLITE CONTAINING ZINC AND BORON USED AS A CATALYST FOR CONVERTING HYDROCARBONS AND METHOD OF MAKING SUCH CATALYST, ASSIGNEE(s): Phillips Petroleum Company, PATENT NO.: 5,997,730 (19991207), FILED: (19980202)

CATALYTIC CRACKING CATALYST AND METHOD FOR CRACKING A HEAVY OIL, ASSIGNEE(s): Idemitsu Kosan Co Ltd; Petroleum Energy Center (JP), PATENT NO.: 5,997,729 (19991207), FILED: (19980116)

CATALYST SYSTEM FOR MAXIMIZING LIGHT OLEFIN YIELDS IN FCC, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,997,728 (19991207), FILED: (19930416)

DEWAXING WITH NICKEL-SILICALITE CATALYST, ASSIGNEE(s): Fina Technology, Inc, PATENT NO.: 5,997,727 (19991207), FILED: (19981022)

METHOD FOR FLUID CATALYTIC CRACKING OF HYDROCARBON FEEDSTOCK, ASSIGNEE(s): Total Raffinage Distribution S A (FR), PATENT NO.: 5,997,726 (19991207), FILED: (19980512)

CATALYST COMPRISING A DIOCTAHEDRAL 2:1 PHYLLOSILICATE PREPARED IN A FLUORIDE MEDIUM AND A PROCESS FOR THE HYDROCONVERSION OF PETROLEUM FEEDS, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 5,997,725 (19991207), FILED: (19970226)

SMOOTH TEXTURED WET-LAID ABSORBENT STRUCTURE, ASSIGNEE(s): BASF Corporation, PATENT NO.: 5,997,690 (19991207), FILED: (19980218)

LOW ABRASION CALCINED KAOLIN PIGMENTS AND ENHANCED FILTRATION METHOD, ASSIGNEE(s): Engelhard Corporation, PATENT NO.: 5,997,626 (19991207), FILED: (19980501)

COATING PIGMENT FOR INK-JET PRINTING, ASSIGNEE(s): Engelhard Corporation, PATENT NO.: 5,997,625 (19991207), FILED: (19980501)

PRESSURE SWING ABSORPTION SYSTEM WITH MULTI-CHAMBER CANISTER, ASSIGNEE(s): Healthdyne Technologies, Inc, PATENT NO.: 5,997,617 (19991207), FILED: (19980130)

PRESSURE SWING ADSORPTION PROCESS AND APPARATUS, ASSIGNEE(s): The BOC Group, Inc, PATENT NO.: 5,997,612 (19991207), FILED: (19980724)

SINGLE VESSEL GAS ADSORPTION SYSTEM AND PROCESS, ASSIGNEE(s): The BOC Group, Inc, PATENT NO.: 5,997,611 (19991207), FILED: (19980724)

METHOD OF TREATING POLYESTER FABRICS, ASSIGNEE(s): Novo Nordisk A/S (DK), PATENT NO.: 5,997,584 (19991207), FILED: (19980715)

METHOD OF STORING AND KIT CONTAINING DRY IMAGE-FORMING MATERIAL, ASSIGNEE(s): Cycolor Systems Co Ltd (JP), PATENT NO.: 5,996,793 (19991207), FILED: (19980406)

PERSONAL EMERGENCY BREATHING SYSTEM WITH LOCATOR FOR SUPPLIED AIR RESPIRATORS AND SHOCK RESISTANT FILTER MOUNTING, ASSIGNEE(s): Brookdale International Systems, Inc (CA), PATENT NO.: 5,996,580 (19991207), FILED: (19980106)

ANIMAL LITTER HAVING THE PROPERTY OF DETECTING URINARY INFECTION IN FELINES, ASSIGNEE(s): Pet Eceology Brands, Inc, PATENT NO.: 5,996,534 (19991207), FILED: (19970625)

EXHAUST GAS PURIFYING DEVICE FOR ENGINE, ASSIGNEE(s): Toyota Jidosha Kabushiki Kaisha (JP), PATENT NO.: 5,996,338 (19991207), FILED: (19971028)

PROCESS FOR THE PURIFICATION OF POLYCARBONATE AND POLYESTER CARBONATE SOLUTIONS, ASSIGNEE(s): Bayer Aktiengesellschaft (DE), PATENT NO.: RE36,432 (19991207), FILED: (19970515)

PARAFFIN ISOMERIZATION PROCESS COMPRISING FRACTIONATION HAVING AT LEAST TWO DRAW-OFF LEVELS ASSOCIATED WITH AT LEAST TWO ISOMERIZATION ZONES, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 5,994,607 (19991130), FILED: (19980804)

METHOD FOR DEHYDROGENATION OF HYDROCARBON, ASSIGNEE(s): Mitsubishi Chemical Corporation (JP), PATENT NO.: 5,994,606 (19991130), FILED: (19970508)

HIGH VISCOSITY POLYALPHAOLEFINS, ASSIGNEE(s): Chevron Chemical Company, PATENT NO.: 5,994,605 (19991130), FILED: (19961203)

METHOD AND APPARATUS FOR LOW TEMPERATURE DESTRUCTION OF HALOGENATED HYDROCARBONS, ASSIGNEE(s): Lockheed Martin Idaho Technologies Company, PATENT NO.: 5,994,604 (19991130), FILED: (19951207)

METHYLATION OF TOLUENE TO PARA-XYLENE, ASSIGNEE(s): Exxon Chemical Patents Inc , PATENT NO.: 5,994,603 (19991130), FILED: (19970529)

PROCESS FOR PREPARING BUTENE OLIGOMERS FROM FISCHER-TROPSCH OLEFINS, ASSIGNEE(s): Huels Aktiengesellschaft (DE), PATENT NO.: 5,994,601 (19991130), FILED: (19970724)

PRODUCTION PROCESS FOR (POLY)ALKYLENE GLYCOL MONOALKYL ETHER, ASSIGNEE(s): Nippon Shokubai Co Ltd (JP), PATENT NO.: 5,994,595 (19991130), FILED: (19971201)

PREPARATION OF N-ALKENYLCARBOXAMIDES, ASSIGNEE(s): BASF Aktiengesellschaft (DE), PATENT NO.: 5,994,562 (19991130), FILED: (19990114)

PYRIDINE/PICOLINE PRODUCTION PROCESS, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,994,550 (19991130), FILED: (19981230)

VINYL CHLORIDE RESIN COMPOSITION FOR POWDER MOLDING, ASSIGNEE(s): Zeon Kasai Co Ltd (JP), PATENT NO.: 5,994,439 (19991130), FILED: (19980506)

SOLID TEXTILE DETERGENT FORMULATION COMPRISING INORGANIC BUILDERS, GLYCINE-N' N-DIACETIC ACID DERIVATIVES AS ORGANIC COBUILDERS AND ANIONIC AND NONIONIC SURFACTANTS, ASSIGNEE(s): BASF Aktiengesellschaft (DE), PATENT NO.: 5,994,290 (19991130), FILED: (19980518)

LIQUID LAUNDRY DETERGENT COMPOSITION CONTAINING ETHOXYLATED AMINE QUATERNARY SURFACTANT, ASSIGNEE(s): Colgate-Palmolive Co, PATENT NO.: 5,994,285 (19991130), FILED: (19990614)

PROCESS FOR BUFFERING CONCENTRATED AQUEOUS SLURRIES, ASSIGNEE(s): Eastman Kodak Company, PATENT NO.: 5,994,041 (19991130), FILED: (19980206)

HYDROPHILIC AND HYDROPHOBIC POLYETHER POLY-URETHANES AND USES THEREFOR, ASSIGNEE(s): Tyndale Plains-Hunter, Ltd, PATENT NO.: 5,993,972 (19991130), FILED: (19980318)

AROMATIC POLYAMIDE FILM, METHOD OF MANU-FACTURING THE SAME AND MAGNETIC RECORDING MEDIUM USING THE SAME FILM, ASSIGNEE(s): Toray Industries, Inc (JP), PATENT NO.: 5,993,938 (19991130), FILED: (19980120)

COVALENTLY REACTIVE PARTICLES INCORPORATED IN A CONTINOUS POROUS MATRIX, ASSIGNEE(s): 3M Innovative Properties Company, PATENT NO.: 5,993,935 (19991130), FILED: (19911011)

DISSOLUTION LIQUID FOR DRUG IN IONTOPHORESIS, ASSIGNEE(s): Takeda Chemical Industries, Ltd (JP), PATENT NO.: 5,993,848 (19991130), FILED: (19960606)

METHOD FOR MANUFACTURE OF PIGMENT-CONTAINING COSMETIC COMPOSITIONS, ASSIGNEE(s): E-L Management Corp, PATENT NO.: 5,993,834 (19991130), FILED: (19971027)

LOW-SILICA FAUJASITE TYPE ZEOLITE AND METHOD FOR PRODUCING THE SAME, ASSIGNEE(s): Tosoh Corporation (JP), PATENT NO.: 5,993,773 (19991130), FILED: (19981124)

GAS SOURCE AND DISPENSING SYSTEM, ASSIGNEE(s): Advanced Technology Materials, Inc , PATENT NO.: 5,993,766 (19991130), FILED: (19970520)

NITROGEN OXIDE-REDUCING CATALYST AND PROCESS FOR REDUCING NITROGEN OXIDES IN EXHAUST GAS, ASSIGNEE(s): Eniricerche S p A (IT); Osaka Gas Company Limited (JP), PATENT NO.: 5,993,764 (19991130), FILED: (19961211)

METHOD OF USING CATALYST CONTAINING NOBLE METAL AND CERIUM DIOXIDE, ASSIGNEE(s): Johnson Matthey Public Limited Company (GB), PATENT NO.: 5,993,762 (19991130), FILED: (19951108)

OXYGEN SCAVENGING METAL-LOADED ION-EXCHANGE COMPOSITIONS, ASSIGNEE(s): W R Grace & Co -Conn, PATENT NO.: 5,993,688 (19991130), FILED: (19980325)

MALEIC ACID BASED COPOLYMER, AND ITS PRODUCTION PROCESS AND USE, ASSIGNEE(s): Nippon Shokubai Co Ltd (JP), PATENT NO.: 5,993,666 (19991130), FILED: (19980107)

CATALYST FOR CRACKING OIL FEEDSTOCKS CONTAMINATED WITH METAL, ASSIGNEE(s): Engelhard Corporation, PATENT NO.: 5,993,645 (19991130), FILED: (19961120)

BASE STOCK LUBE OIL MANUFACTURING PROCESS, ASSIGNEE(s): Chevron U S A Inc, PATENT NO.: 5,993,644 (19991130), FILED: (19970626)

PROCESS FOR NAPHTHA HYDROCRACKING, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,993,643 (19991130), FILED: (19931112)

HYDROCARBON CONVERSION PROCESS USING A ZEOLITE BOUND ZEOLITE CATALYST, ASSIGNEE(s): Exxon Chemical Patents Inc, PATENT NO.: 5,993,642 (19991130), FILED: (19951122)

TWO STAGE PRESSURE SWING ADSORPTION PROCESS, ASSIGNEE(s): The Boc Group, Inc, PATENT NO.: 5,993,517 (19991130), FILED: (19980317)

ADSORBENTS FOR SEPARATING NITROGEN FROM A FEED GAS, ASSIGNEE(s): BG plc (GB), PATENT NO.: 5,993,516 (19991130), FILED: (19980409)

POLYOL ESTER DISTILLATE FUELS ADDITIVE, ASSIGNEE(s): Exxon Research and Engineering Co, PATENT NO.: 5,993,498 (19991130), FILED: (19980403)

CONTROLLED GAS GENERATION FOR GAS-DRIVEN INFUSION DEVICES, ASSIGNEE(s): Apex Medical Technologies, Inc, PATENT NO.: 5,992,700 (19991130), FILED: (19970528)

ASSEMBLY OF SELF-STANDING POUCHES, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,992,631 (19991130), FILED: (19980928)

ORGANIC ELECTROLUMINESCENT DISPLAY WITH PROTECTIVE LAYER ON CATHODE AND AN INERT MEDIUM, ASSIGNEE(s): NEC Corporation (JP), PATENT NO.: 5,990,615 (19991123), FILED: (19980203)

ADSORBENT FOR THE REMOVAL OF TRACE QUANTITIES FROM A HYDROCARBON STREAM AND PROCESS FOR ITS USE, ASSIGNEE(s): United Catalysts Inc, PATENT NO.: 5,990,372 (19991123), FILED: (19980112)

PROCESS FOR THE SELECTIVE HYDROISOMERIZATION OF LONG LINEAR AND/OR SLIGHTLY BRANCHED PARAFFINS USING A CATALYST BASED ON A MOLECULAR SIEVE, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 5,990,371 (19991123), FILED: (19970505)

PROCESS FOR PRODUCING LIGHT OLEFINS, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,990,369 (19991123), FILED: (19980209)

SELECTIVE XYLENE DISPROPORTIONATION PROCESS FOR PSEUDOCUMENE PRODUCTION, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,990,366 (19991123), FILED: (19981222)

CATALYST COMPRISING ZSM-5, RHENIUM AND A SELECTIVATING AGENT, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,990,365 (19991123), FILED: (19970203)

HYDROXIMIC ACID DERIVATIVES, ASSIGNEE(s): Rhone-Poulenc Agrochimie (FR), PATENT NO.: 5,990,161 (19991123), FILED: (19981230)

PROCESS FOR THE PRODUCTION OF A DETERGENT COMPOSITION, ASSIGNEE(s): Lever Brothers Company, PATENT NO.: 5,990,073 (19991123), FILED: (19960628)

SYSTEM FOR DELIVERING HYDROPHOBIC LIQUID BLEACH ACTIVATORS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,990,070 (19991123), FILED: (19981215)

POWDER DETERGENT COMPOSITION HAVING IMPROVED SOLUBILITY, ASSIGNEE(s): Amway Corporation, PATENT NO.: 5,990,068 (19991123), FILED: (19980310)

DISHWASHING DETERGENT COMPOSITIONS CONTAINING ORGANIC DIAMINES FOR IMPROVED GREASE CLEANING, SUDSING, LOW TEMPERATURE STABILITY AND DISSOLUTIO, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,990,065 (19991123) FILED: (19961220)

COMPOSITIONS CONTAINING AN ORGANO-SUBSTITUTED BENZOPHENONE, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,990,056 (19991123), FILED: (19970604)

METAL COMPLEX DERIVED CATALYST AND METHOD OF FORMING, ASSIGNEE(s): Southwest Research Institute, PATENT NO.: 5,990,039 (19991123), FILED: (19970108)

CATALYST FOR PURIFYING OXYGEN RICH EXHAUST GAS, ASSIGNEE(s): Nissan Motor Co Ltd (JP), PATENT NO.: 5,990,038 (19991123), FILED: (19980223)

METHOD OF TREATING SPONTANEOUSLY COMBUSTIBLE CATALYSTS, ASSIGNEE(s): CRI International, Inc, PATENT NO.: 5,990,037 (19991123), FILED: (19970718)

HYDROCARBON CONVERSION CATALYST COMPOSITION AND PROCESSES THEREFOR AND THEREWITH, ASSIGNEE(s): Phillips Petroleum Company, PATENT NO.: 5,990,032 (19991123), FILED: (19970930)

ZEOLITE CATALYST WITH ENHANCED DEALKYLATION ACTIVITY AND METHOD FOR PRODUCING SAME, ASSIGNEE(s): Fina Technology, Inc, PATENT NO.: 5,990,031 (19991123), FILED: (19961126)

LIGHT-SENSITIVE SILVER HALIDE PHOTOGRAPHIC MATERIALS COMPRISING ZEOLITES, ASSIGNEE(s): Agfa-Gevaert, N V (BE), PATENT NO.: 5,989,797 (19991123), FILED: (19981007)

PROCESS FOR SYNTHESIZING AND CONTROLLING THE PARTICLE SIZE AND PARTICLE SIZE DISTRIBUTION OF A MOLECULAR SIEVE, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,989,518 (19991123), FILED: (19981229)

METHOD OF PRODUCING GRANULAR AMORPHOUS SILICA, ASSIGNEE(s): Mizusawa Industrial Chemical, Ltd (JP), PATENT NO.: 5,989,510 (19991123), FILED: (19960617)

PROCESS FOR THE REMOVAL AND RECOVERY OF MERCURY FROM HYDROCARBON STREAMS, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,989,506 (19991123), FILED: (19961218)

MULTI-WAY VALVE AND WATER PURIFIER USING THE SAME, ASSIGNEE(s): Toray Industries, Inc (JP), PATENT NO.: 5,989,425 (19991123), FILED: (19961112)

STAGED UPFLOW HYDROPROCESSING WITH NONCATALYTIC IMPURITY REMOVAL FROM THE FIRST STAGE VAPOR EFFLUENT, ASSIGNEE(s): Exxon Research and Engineering Company, PATENT NO.: 5,989,411 (19991123), FILED: (19981023)

PROCESS FOR IMPROVING THE POUR POINT OF PARAFFIN FEEDSTOCKS WITH A CATALYSTCONTAINING AN IM-5 ZEOLITE BASE, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 5,989,410 (19991123), FILED: (19981015)

INK JET RECORDING MATERIAL AND PRODUCING PROCESS THEREOF, ASSIGNEE(s): New Oji Paper Co Ltd (JP), PATENT NO.: 5,989,378 (19991123), FILED: (19960821)

SEPARATION OF NITROGEN FROM MIXTURES THEREOF WITH METHANE UTILIZING BARIUM EXCHANGED ETS-4, ASSIGNEE(s): Engelhard Corporation, PATENT NO.: 5,989,316 (19991123), FILED: (19971222)

ALPHA.-AMYLASE MUTANTS, ASSIGNEE(s): Novo Nordisk A/S (DK), PATENT NO.: 5,989,169 (19991123), FILED: (19960213)

APPARATUS AND METHOD FOR FORMING OXYGEN-ENRICHED GAS AND COMPRESSION THEREOF FOR HIGH-PRESSURE MOBILE STORAGE UTILIZATION, ASSIGNEE(s): Invacare Corporation, PATENT NO.: 5,988,165 (19991123), FILED: (19971001)

SCR REACTANT INJECTION GRID, INVENTOR(s): Anderson, David K.; Rini, Michael J., PATENT NO.: 5,988,115 (19991123), FILED: (19980811)

COMBINATION CATALYTIC CONVERTER AND HEAT EXCHANGER THAT MAINTAINS A CATALYST SUBSTRATE WITHIN AN EFFICIENT OPERATING TEMPERATURE RANGE FOR EMMISIONS REDUCTION, ASSIGNEE(s): Chrysler Corporation, PATENT NO.: 5,987,885 (19991123), FILED: (19980129)

PROCESS FOR PRODUCING CYCLOOLEFIN RANDOM COPOLYMER, ASSIGNEE(s): Mitsui Chemicals, Inc (JP), PATENT NO.: RE36,406 (19991123), FILED: (19931209)

GASOLINE OCTANE ENHANCEMENT IN FLUID CATALYTIC CRACKING PROCESS WITH SPLIT FEED INJECTION TO RISER REACTOR, ASSIGNEE(s): Chevron Research and Technology Company, PATENT NO.: RE36,403 (19991123), FILED: (19941216)

PROCESS FOR ALKYLATING HYDROCARBONS, ASSIGNEE(s): Akzo Nobel NV (NL), PATENT NO.: 5,986,158 (19991116), FILED: (19971120)

ZEOLITE BASED CATALYST OF MODIFIED MAZZITE STRUCTURE TYPE AND ITS USE FOR THE DISMUTATION AND/OR TRANSALKYLATION OF ALKYLAROMATIC HYDROCARBONS, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 5,986,156 (19991116), FILED: (19980406)

PROCESS FOR THE HYDROGENATION OF AROMATIC COMPOUNDS COMPRISING CHLORINE INJECTION, USING CATALYSTS BASED ON A NOBLE METAL, ASSIGNEE(s): Institut Francais du Petrole (FR), PATENT NO.: 5,986,154 (19991116), FILED (19980626)

DI-ISOPROPYL ETHER SYNTHESIS AND DRY PRODUCT RECOVERY, ASSIGNEE(s): Mobil Oil Corporation, PATENT NO.: 5,986,148 (19991116), FILED: (19930802)

POLYCARBONATE RESIN WITH A REDUCED VOLATILE CHLORINE CONTENT AND PROCESS FOR PRODUCING THE SAME, ASSIGNEE(s): Mitsubishi Chemical Corporation (JP), PATENT NO.: 5,986,037 (19991116), FILED: (19971209)

METALLOCENE COMPOUND AND METHOD FOR PRODUCING POLYMER BY USING IT AS POLYMERIZATION CATALYST, ASSIGNEE(s): Korea Academy of Industrial Technology (KR), PATENT NO.: 5,986,025 (19991116), FILED: (19970506)

COMPOSITION BASED ON HIGH MOLECULAR WEIGHT ORGANOTIN MALEATES WHICH CAN BE USED TO STABILIZE THERMOPLASTIC POLYMERS, PROCESS FOR PRODUCING THE SAID COMPOSITIONS, ASSIGNEE(s): Elf Atochem North America Inc (US); Elf Atochem S A (FR), PATENT NO.: 5,985,967 (19991116), FILED: (19980109)

STABILIZED POLYVINYL CHLORIDE CONTAINING RECYCLED MATERIAL, ASSIGNEE(s): Witco Vinyl Additives GmbH (DE), PATENT NO.: 5,985,964 (19991116), FILED: (19971218)

WATER-ABSORBENT RESIN, PROCESS FOR PRODUCTION THEREOF, AND WATER-ABSORBENT RESIN COMPOSITION, ASSIGNEE(s): Nippon Shokubai Co Ltd (JP), PATENT NO.: 5,985,944 (19991116), FILED: (19960802)

PREVENTION OF ADVERSE BEHAVIOR, DIARRHEA, SKIN DISORDERS AND INFECTIONS OF THE HIND GUT ASSOCIATED WITH ACIDIC CONDITIONS IN HUMANS AND ANIMALS BY THE APPLICATION OF ANTIBIOTICS, INVENTOR(s): Rowe, James Baber (AU), PATENT NO.: 5,985,891 (19991116), FILED: (19970829)

ANTIMICROBIAL COMPOSITION, ASSIGNEE(s): Fujiwara, Hitoshi; Suganuma, Akio (JP), PATENT NO.: 5,985,795 (19991116), FILED: (19971003)

AGRICULTURAL CHEMICAL COMPOSITION, ASSIGNEE(s): KAO Corporation (JP), PATENT NO.: 5,985,794 (19991116), FILED: (19971204)

METHOD OF MAKING ACID CONTACTED ENHANCED ALUMINUM OXIDE ADSORBENT PARTICLE, ASSIGNEE(s): Project Earth Industries, Inc, PATENT NO.: 5,985,790 (19991116), FILED: (19961021)

SILICON SUBSTITUTED EMC-2 ZEOLITE: LZ-281, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,985,782 (19991116), FILED: (19970219)

PROCESS FOR THE FERMENTATIVE PREPARATION OF CLAVAM DERIVATIVES WHEREBY THE LEVELS OF AMMONIA AND UREA IN THE FERMENTATION MEDIUM ARE KEPT LOW, ASSIGNEE(s): SmithKline Beecham p l c (GB), PATENT NO.: 5,985,624 (19991116), FILED: (19970826)

INK-JET RECORDING FILM OF IMPROVED INK FIXING COMPRISING A COMBINATION OF SILICA POWDERS, ASSIGNEE(s): SOMAR Corporation (JP), PATENT NO.: 5,985,425 (19991116), FILED: (19980331)

COMBINATORIAL SYNTHESIS OF NOVEL MATERIALS, ASSIGNEE(s): Symyx Technologies; The Regents of the University of California, PATENT NO.: 5,985,356 (19991116), FILED: (19941018)

BIOMOLECULAR SYNTHESIS OF QUANTUM DOT COMPOSITES, ASSIGNEE(s): University of Massachusetts Lowell, PATENT NO.: 5,985,353 (19991116), FILED: (19970730)

SHELF-LIFE EXTENDER FOR FOOD USE, INVENTOR(s): Okada, Toru; Kuranari, Kenji (JP), PATENT NO.: 5,985,303 (19991116), FILED: (19960802)

ANTIBACTERIAL CELLULOSE FIBER AND PRODUCTION PROCESS THEREOF, ASSIGNEE(s): Kenji Nakamura; Koji Nakamura (JP), PATENT NO.: 5,985,301 (19991116), FILED: (19980211)

PROCESS FOR PREPARING FERRIERITE, ASSIGNEE(s): PQ Corporation, PATENT NO.: 5,985,238 (19991116), FILED: (19970630)

PROCESS FOR REMOVING SULFUR COMPOUNDS FROM INDUSTRIAL GASES, ASSIGNEE(s): Bayer Aktiengesellschaft (DE), PATENT NO.: 5,985,227 (19991116), FILED: (19971023)

NITROGEN OXIDES REDUCTION CATALYST AND PROCESS FOR REDUCING NITROGEN OXIDES IN EXHAUST GAS, ASSIGNEE(s): Eniricerche S p A (IT); Osaka Gas Company Limited (JP), PATENT NO.: 5,985,225 (19991116)

OXYGEN SCAVENGING METAL-LOADED HIGH SURFACE AREA PARTICULATE COMPOSITIONS, ASSIGNEE(s): W R Grace & Co -Conn , PATENT NO.: 5,985,169 (19991116), FILED: (19970523)

STAGED UPFLOW AND DOWNFLOW HYDROPROCESSING WITH NONCATALYTIC REMOVAL OF UPFLOW STAGE VAPOR IMPURITIES, ASSIGNEE(s): Exxon Research and Engineering Co, PATENT NO.: 5,985,135 (19991116), FILED: (19981023)

PROCESS FOR THE SIMULTANEOUS PRODUCTION OF LUBRICATING OIL BASE STOCKS AND MOTOR FUEL, ASSIGNEE(s): UOP LLC, PATENT NO.: 5,985,132 (19991116), FILED: (19971024)

HYDROPROCESSING IN A COUNTERCURRENT REACTION VESSEL, ASSIGNEE(s): Exxon Research and Engineering Company, PATENT NO.: 5,985,131 (19991116), FILED: (19960823)

PROCESS FOR MANUFACTURING A COMPOSITION USEFUL AS SOAP OR COSMETIC, ASSIGNEE(s): Zion Synthetic Fiber Co Ltd (KR), PATENT NO.: 5,985,021 (19991116), FILED: (19980123)

COMPOSITIONS AND PROCESSES FOR REMEDIATING HARDENED CEMENTITIOUS MATERIALS, ASSIGNEE(s): FMC Corporation, PATENT NO.: 5,985,011 (19991116), FILED: (19980910)

SORBENT-BASED FLUID STORAGE AND DISPENSING SYSTEM WITH HIGH EFFICIENCY SORBENT MEDIUM, ASSIGNEE(s): Advanced Technology Materials, Inc, PATENT NO.: 5,985,008 (19991116), FILED: (19980520)

OXYGEN PRODUCTION PROCESS BY PRESSURE SWING ADSORPTION SEPARATION, ASSIGNEE(s): Nippon Sanso Corporation (JP), PATENT NO.: 5,985,003 (19991116), FILED: (19980407)

HEAT CELLS, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,984,995 (19991116), FILED: (19960329)

CRYOGENIC SYSTEM FOR PRODUCING ULTRA-HIGH PURITY NITROGEN, ASSIGNEE(s): Praxair Technology, Inc, PATENT NO.: 5,983,667 (19991116), FILED: (19971031)

SYSTEM AND METHOD FOR CONTROLLING EXHAUST GAS TEMPERATURES FOR INCREASING CATALYST CONVERSION OF NOX EMISSIONS, ASSIGNEE(s): Chrysler Corporation, PATENT NO.: 5,983,628 (19991116), FILED: (19980129)

FREEZING TYPE WORKPIECE FIXING METHOD, INVENTOR(s): Tarumizu, Yoshitaka, PATENT NO.: 5,983,483 (19991116), FILED: (19980217)

PROCESS OF GENERATING C3 - AND C4 -OLEFINS FROM A FEED MIXTURE CONTAINING C4 TO C7 OLEFINS, ASSIGNEE(s): Metallgesellschaft Aktiengesellschaft (DE), PATENT NO.: 5,981,819 (19991109), FILED: (19971114)

XYLENE ISOMERIZATION PROCESS, ASSIGNEE(s): Exxon Chemical Patents Inc , PATENT NO.: 5,981,817 (19991109), FILED: (19970410)

HETEROCYCLIC BIARYL COMPOUNDS, PHARMACEUTICAL AND COSMETIC COMPOSITIONS CONTAINING THEM AND USES THEREOF, ASSIGNEE(s): Centre International de Recherches Dermatologiques Galderma (FR), PATENT NO.: 5,981,776 (19991109), FILED: (19971124)

TRICYCLIC COMPOUNDS HAVING FUNGICIDAL ACTIVITY, THEIR PREPARATION AND THEIR USE, ASSIGNEE(s): Sankyo Company, Limited (JP), PATENT NO.: 5,981,752 (19991109), FILED: (19980409)

POLYPEPTIDE WITH REDUCED ALLERGENICITY, ASSIGNEE(s): Novo Nordisk A/S (DK), PATENT NO.: 5,981,718 (19991109), FILED: (19980910)

ANTI-BACTERIAL WATER ABSORBING AGENT AND ANTI-BACTERIAL WATER ABSORBENT MATERIAL, ASSIGNEE(s): Sanyo Chemical Industries, Ltd (JP), PATENT NO.: 5,981,668 (19991109), FILED: (19971027)

DETERGENT COMPOSITIONS COMPRISING A CATIONIC ESTER SURFACTANT AND A GREASE DISPENSING AGENT, ASSIGNEE(s): The Procter & Gamble Company, PATENT NO.: 5,981,460 (19991109), FILED: (19981130)

CONCENTRATED LIQUID GEL WAREWASH DETERGENT, ASSIGNEE(s): Kay Chemical Company, PATENT NO.: 5,981,457 (19991109), FILED: (19970131)

THERMAL PRINTING SHEET, ASSIGNEE(s): Sony Corporation (JP), PATENT NO.: 5,981,430 (19991109), FILED: (19980313)

PHOTOCATALYST HAVING AN X-RAY DIFFRACTION PATTERN WHICH IS SUBSTANIALLY FREE OF CHARACTERISTIC REFLECTIONS ASSOCIATED WITH CRYSTALLINE TIO2, ASSIGNEE(s): University Technologies International Inc (CA), PATENT NO.: 5,981,426 (19991109), FILED: (19970829)

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編集後記

2000年の第1号をお届けいたします。世の中ではミレニアムという用語が飛び交っておりますが，西暦0年の時代でもゼオライトは「炙ると蒸気を出す変な石」としては鉱物屋には知られていたと想像します。ゼオライトが鉱物学的に記載されたのは1756年にスウェーデンのCronstedtによるというのが一般ですが，この約250年間の歴史の中で最近の50年間のゼオライト科学の進歩速度は突出していたと思います。多くの学会誌で，この100年を振り返る特集を企画しているようですが，ゼオライト科学はまだ産声をあげたばかりという気がしており，新世紀に向けての新展開が楽しみです。2001年にZeolite Odyssey，2006年にゼオライト発見250周年といった企画をどなたか提案しませんか。

(A. Y.)

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表紙裏写真 試料はモルデナイトを含む天然ゼオライト岩
p.198 図書紹介 右段上から5行目 「製鉄スラッジ」→「製紙スラッジ」
p.198 図書紹介 右段上から12行目 「性などを」→「性など」

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