

Multiphoton ionization of 3-chlorophenol.

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Multiphoton ionization excitation spectra of 3-chlorophenol, a presumable precursor for production of 2,3,7,8-tetrachlorodibenzo-p-dioxine in an incinerator, were observed. The spectrum was refined by distillation off the water.

Bioinspired water-soluble thymine based polymers

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A benign control-release mechanism was developed using bioinspired water-soluble thymine based polymers co-polymerized with quaternary ammonium salts. It was shown that UV exposure induced photo-dimerization between the thymine molecules in the polymer. It was also demonstrated that the photodimerization increased proportionally to increased UV exposure.

Environmental Application of New Photocatalysts under Solar Light

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Visible-light-driven new photocatalysts, BiVO₄ and AgNbO₃, were prepared and applied to degradation of organic pollutants such as alkylphenols under solar light. Photodegradation rates, CO₂ mineralization yields, and photoproducts were investigated and compared to those of TiO₂ photocatalyst. From these results, it is concluded that BiVO₄ and AgNbO₃ have a great ability to eliminate hydrophobic organic pollutants in wastewater under solar light.

A3-04

Synthesis and Microwave Polymerization of Ethylene Isophthalate Cyclic Dimer

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We first succeeded the selective synthesis of ethylene isophthalate cyclic dimer (c-2mer) via an ester-ester exchange reaction using non-halogenated solvent. This gave a 96.6% yield having a white crystal appearance. Microwave (MW) co-polymerization of the c-2mer and bis(hydroxyethyl) terephthalate could be carried out successfully in bulk and resulted in a polymer with M_w 23,500 (M_w/M_n 3.8). The reaction occurred below the melting point of the c-2mer by means of MW irradiation. Since synthesis by present method does not need solvent, new process application might become possible.

A3-05

The Function Enhancement of Solid Catalyst by Microwave Plasma Technique

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Microwave-induced catalytic reactions with regard to the selective synthesis of ethylene from methane were developed. The reaction was initialized using the energy from microwave irradiation and promoted by an alumina-based Pt catalyst. As results, production of ethylene from methane by a continuous, low-power-density microwave plasma process can be achieved via dehydrogenation and/or hydrogenation under reduced pressure.

A3-06

Cellulose Decomposition under Microwave Irradiation State

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Using microwave irradiated argon plasma, a direct conversion technology of biomass resources derived from

plant into relatively important valuables was developed under reduced pressure. Cellulose which constitutes the main component of plant biomass was used as a reactant material. The marketing grade argon was supplied as a plasma source, and the effect of irradiation time on properties of gaseous and oily products were examined.

A3-07

Development of the Continuous-flow Reaction System Based on the Lewis Acid-Catalyzed Reactions in Fluorous Biphasic System

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Lanthanide bis(perfluoroalkanesulfonyl)amide-catalyzed reactions such as esterification in organic-fluorous biphasic were performed to yield the products with high TONs using the continuous-flow system of the small- and bench-scale apparatus which consisted of reactor with mechanical stirrer and decanter.

A3-08

Halogen-Free Laser Bleaching of Cellulosic Fabrics

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Decoloration of water-insoluble natural colored compounds adsorbed or chemically bound on natural cellulosic fabrics were conducted effectively by selective excimer laser-induced photolyses of the colored compounds in the presence of sodium borohydride or sodium peroxocarbonate aqueous solutions.

A3-09

Oxidative Polymerization of Phenols in Aqueous Media

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We report, for the first time, the oxidative polymerization of phenols in aqueous media. Poly(2,6-dimethyl-1,4-phenyleneoxide) prepared in aqueous media was essentially identical to the commercial one. Phenol derivatives such as 2,4,6-trimethylphenol were also polymerizable.

**Dehydrogenation of Cyclohexane as a Chemical Hydrogen Carrier
using a Palladium Membrane Reactor**

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Cyclohexane is noted as a hydrogen carrier without carbon dioxide emission in the dehydrogenation process because of its higher hydrogen content. The major subject is that the dehydrogenation is limited by thermodynamic equilibrium. It is shown that such a difficulty can be improved by use of a palladium membrane reactor, and then a high recovery of hydrogen exceeding 90% can be obtained.

**Hydrogen production from cyclohexane as a chemical hydrogen carrier
using a palladium membrane reactor**

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Cyclohexane is noted as a hydrogen carrier without carbon dioxide emission in the dehydrogenation process, whereas the steam reforming process of methanol and the like produces not only hydrogen but also CO₂. In addition, a higher hydrogen content (7.1wt%) of cyclohexane is very attractive compared with metal hydrides (at most 3 wt%). Additional advantage is that cyclohexane is liquid: this is very important property relating to the transportability. The dehydrogenation, limited by thermodynamic equilibrium, can be enhanced very much by use of membrane reactors.

Production of Basic Magnesium Carbonate Particles by Reactive Crystallization

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From the viewpoint of green sustainable chemistry, CO₂ in the exhausted gas was fixed as carbonates by utilizing the valuable resources dissolved in the sea water. CO₂ gas was reacted with magnesium and calcium ions in waste sea water obtained from industries using sea water. To treat massive CO₂, however, applicable reaction crystallizers and processes have to be developed on the basis of studies of magnesium and calcium carbonates crystallization. We discuss the reaction crystallization method of optimum particles of magnesium carbonate.

A3-13

Efficient photocatalytic degradation of organic pollutants diluted in water using TiO₂ supported on the fluoride-modified hydrophobic mesoporous silica

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The TiO₂ photocatalysts loaded on the fluoride-modified hydrophobic mesoporous silica were prepared. These TiO₂ photocatalysts loaded on hydrophobic mesoporous silica can exhibit the highly selective adsorption of organic compounds diluted in the water and the high reactivity for photocatalytic degradation.

A3-14

CLAY-ASSISTED SYNTHETIC REACTIONS IN APROTIC SOLVENT

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In situ generated clay-supported paraformaldehyde reagent in MeCN can successfully be used for the deprotection of oximes to the carbonyl compounds and the conversion of amides to the nitriles in high yields under mild conditions. The clay catalyst can be reused in the latter reaction without serious loss of its activity.