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Synthesis of MFI Zeolites using DABCO and Methylamine Reagents

A novel synthesis of MFI zeolites yields isolated active sites for selective petrochemical reactions.

Researchers at Purdue University have developed new methodologies for the synthesis of MFI zeolites. Traditional MFI zeolites typically use organic structure-directing agents such as tetraproylammonium-based solutions (TPA+) that lead to arbitrary and uncontrolled distributions of acid sites. Instead, Purdue researchers have prepared new MFI zeolites via alternative organic structure-directing agents that generate only isolated acid sites. X-ray diffraction has been employed to validate the framework topology of the new ZSM-5 zeolites. Purdue researchers have achieved this unique MFI zeolite with isolated acid sites with aluminosilicate gels containing DABCO and methylamine reagents, and have used cobalt (II) ion (Co2+) uptake as a measure of paired acid site content. This gives an indication of the potential of the MFI zeolite material for adsorption of carbon dioxide, alkanes, and water, as well as acid-catalyzed reaction capacity including for hydrocarbon cracking. The state-of-the-art crystalline MFI materials can be implemented in petrochemical applications for control of olefin oligomerization reactions.

Advantages:

-Isolated Binding and Active Sites

-Lower Cost

-Promising Adsorption and Catalytic Selectivity

Potential Applications:

-Petrochemical Processing

-Zeolite Research and Development

Technology Validation:

Technology ID
2021-GOUN-69167

Category
Chemicals & Advanced Materials/Specialty & Performance Chemicals
Semiconductors/Devices & Components
Semiconductors/Packaging & Integration

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The Co2+ ion uptake has been studied in fully functional zeolites, of which the crystal structure has been validated, and indicates that MFI zeolites predominantly have isolated acid sites.

Recent Publication:

"Experimental and Theoretical Assessment of Aluminum Proximity in MFI Zeolites and Its Alteration by Organic and Inorganic Structure-Directing Agents"

Chemistry of Materials

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