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Microporous and Mesoporous Materials for Catalytic Applications

www.mdpi.com/books/reprint/10711

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ISBN 978-3-7258-3598-0 (Hardback)
ISBN 978-3-7258-3597-3 (PDF)

Microporous and mesoporous materials are applied in refinery processes for the production of fuel components, petro-chemicals, and fine and speciality chemicals. Furthermore, these catalytic materials are utilized in exhaust gas emission control, water purification, drug delivery, and solutions for environment-related problems. Microporous and mesoporous catalytic materials modified with transition and noble metals are synthesized via evaporation impregnation, deposition precipitation, ion exchange, chemical vapor deposition, and atomic layer deposition. Metal nanoparticle-size distributions, dispersions, metal-support interations, and acid site amounts can be designed by selecting metal modification methods. In-depth physico-chemical characterizations are carried out using nitrogen physisorption for surface area pore volume and pore size distributions, scanning electron microscopy for morphological features, transmision electron microscopy for metal nanoparticle-size distributions, X-ray powder diffraction for structural measurements, and FTIR with pyridine as the probe molecule for Brönsted and Lewis acid site amounts. Microporous and mesoporous materials will be applied to the development of green process technology for the production of renewable energy, bulk chemicals, and fine chemical manufacturing.

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