



Industrial Consultancy & Sponsored Research (IC&SR)

An Improved Process for the Acid-mediated Synthesis of Ordered Mesoporous Aluminosilicates and the Product Thereof

IITM Technology Available for Licensing

Problem Statement

- Conventional methods for synthesizing ordered mesoporous aluminosilicates (OMAS) **struggle to stabilize trivalent aluminum** in the tetrahedral framework structure at **high aluminum content**.
- This limitation compromises the **effectiveness of OMAS in various industrial applications** lacking specific structural and textural properties.
- Existing synthesis approaches often result in **OMAS materials with suboptimal catalytic activity** in tertiary-butylation of phenol reaction.
- Existing methods **lack uniformity** and may **not reliably yield OMAS materials** suitable for specific industrial need, leading to **inefficiencies and inconsistencies** in material production.
- The presence of aluminum in less desirable coordination states **hinders the performance of OMAS** as solid acid catalysts, reducing **selectivity and efficiency** in catalytic reactions.
- Hence, there is a need for a **standard synthesis process to produce OMAS consistently with desired properties**.

Technology Category/ Market

Categories: Chemistry & chemical Analysis

Industry: Chemical manufacturing, Catalyst manufacturing, Adsorbents industry

Applications: Solid Acid Catalysts, Catalyst Support Structures, Selective Adsorption

Market: The global catalyst market was valued at **\$36 Bn in 2020**, it is projected to reach **\$58 Bn by 2030**, growing at **4.9% CAGR** in 2021-2030.

Intellectual Property

IITM IDF No.: 1404 | IP No.: 375449 (Granted)

TRL (Technology Readiness Level)

TRL- 3: Proof of Concept Stage.

Research Lab

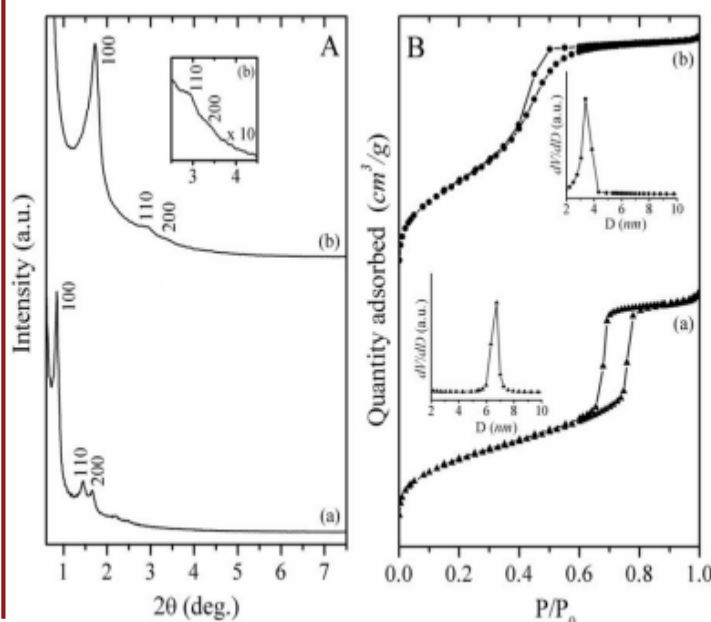
Prof. Selvam P,
NCCR & Department of Chemistry

Technology

The instant invention discloses an innovative Method: the "**intrinsic hydrolysis method**" for synthesizing ordered mesoporous aluminosilicates (OMAS), ensuring **trivalent aluminum stability** even at **high content**, without compromising the **mesostructure**, resulting in OMAS with **superior structural and textural properties**.

- The disclosed process involves dissolving aluminum nitrate and citric acid, adjusting pH, and adding absolute ethanol to **obtain crystalline aluminum citrate**. Sequential addition of precursors and hydrothermal treatment **yields surfactant-free OMAS samples**.
- The synthesized OMAS exhibit **medium-to-strong Brønsted acidity** & demonstrate excellent catalytic activity, particularly in the **tertiary-butylation of phenol, with high selectivity towards specific products**.
- This invention is extensively characterized using various analytical techniques such as **XRD, TEM, SEM, MAS-NMR, XRF, and NH3-TPD** to ensure quality and performance.

FIG. 1: X-Ray Diffraction (XRD) patterns (A) and N2 sorption isotherms with pore size distribution (B) of (a) H-AISBA-15(30) and (b) H-AIIITM-56(30).



CONTACT US

Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in

sm-marketing@iitm.ac.in

Phone: +91-44-2257 9756/ 9719

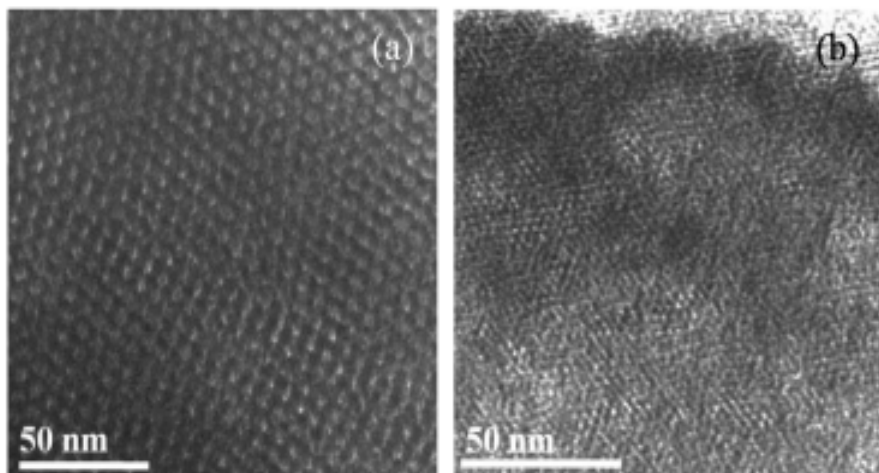


FIG. 2 illustrates Transmission Electron Microscopy (TEM) images of (a) H-AISBA-15(30) and (b) H-AIITM-56(30).

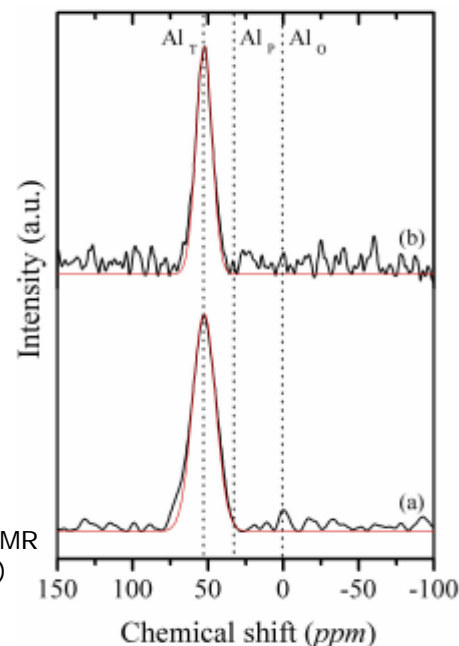


FIG. 3 illustrates ^{27}Al MAS-NMR spectra of (a) H-AISBA-15(30) and (b) H-AIITM-56(30).

Key Features / Value Proposition

User perspective:-

- **Enhanced Performance:** OMAS offer superior catalytic activity and selectivity, ensuring efficient chemical processes.
- **Tailored Properties:** Exclusive trivalent aluminum coordination guarantees consistent material properties for reliable outcomes.
- **Ease of Use:** Standardized synthesis simplifies manufacturing, providing optimized OMAS without complex adjustments.

Industrial perspective:-

- **Cost Efficiency:** Improved synthesis reduces production costs, waste, and optimizes raw material utilization.
- **Increased Productivity:** High-performance OMAS enhances process efficiency, increasing throughput.
- **Competitive Advantage:** Access to superior OMAS gives manufacturers a competitive edge, enabling enhanced products and services.

Technology perspective:-

- **Innovative Synthesis Method:** Intrinsic hydrolysis method revolutionizes OMAS synthesis, overcoming previous limitations.
- **Versatility:** Standardized protocol adapts to diverse compositions, catering to varied industrial requirements.
- Technology scales to industrial levels, facilitating mass production of consistent-quality OMAS.

CONTACT US

Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
<https://ipm.icsr.in/ipm/>

Email: smipm-icsr@icsrpis.iitm.ac.in

sm-marketing@iimail.iitm.ac.in

Phone: +91-44-2257 9756/ 9719