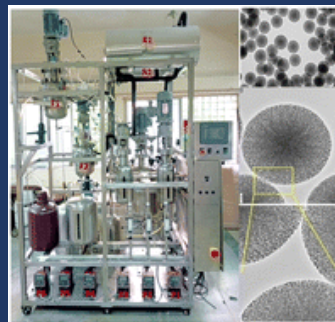


Continuous & Tunable Process for the Large-Scale Synthesis of Mesoporous & Nanoporous Silica

- CSIR-NCL has developed a continuous, scalable and adaptable process for synthesizing mesoporous silica nanoparticles (MSNs) & nanoporous silica nanoparticles
- The developed process is tunable, scalable & delivers a monodispersed product within a short reaction time (20-30 minutes)
- The process is demonstrated at 1 kg/day scale (TRL-4) using a fully automated pilot plant & is available for licensing/co-development



Technology Available For Licensing/ Co-development

BACKGROUND

- Mesoporous and nanoporous silica particles have porosity in the range of few nm to few μm . Well-known commercial grades are MCM-41 & SBA-15.
- MSNs with high porosity and surface area are biocompatible and non-toxic
- Conventional batch processes require meticulous parameter control through the gradual addition of reagents
- Typical batch times range from hours to a few days due to slow reactions.

TECHNOLOGY OFFERING

CSIR-NCL process is rapid, scalable, tunable & continuous and hence, no batch consistency issue

Product specifications:

- **Form:** Powder
- **Particle size (nm):** 50, 100, 250, 500, 1500
- **Surface area:** $> 771 \text{ m}^2/\text{g}$
- **Pore Diameter:** 2-4 nm
- **Pore volume:** $> 0.467 \text{ cc/g}$

STAGE OF DEVELOPMENT

- The process is demonstrated at 1 kg/day scale with a fully automatic pilot plant
- Available for licensing/co-development (TRL-4)

MARKET POTENTIAL

- In 2022, the global Mesoporous Silica market size was \$171.1 million & is expected to reach \$388.7 million by 2030, with a CAGR of 10.4% from 2023-2030.
- North America has largest market in 2022 which is 36.2%
- Asia Pacific has fastest growing market

VALUE PROPOSITION

- Monodispersed product
- Continuous & scalable process
- Shorter reaction times (20-30 minutes)
- Clogging free process: Smart composition selection
- Tunable process to make monodisperse MSNs (controllable particle size)
- Unreacted material is recycled, resulting in zero discharge

Applications:

- Drug delivery, Support material to make chromatographic media
- Solubility enhancer in pharmaceutical formulations
- Imaging & diagnostic agent
- Catalysis (Largest application)
- Enzyme immobilization (bio-catalysis)
- Direct air capture of CO_2

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