UNIVERSITY OF MINNESOTA
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Direct Synthesis of High Aspect Ratio Zeolite Nanosheets

IP Status: Pending US Patent; **Application #:** 15/791,876

Zeolite Nanosheets with Nanometer Thicknesses

A newly developed direct synthesis method creates zeolite nanosheets with nanometer thicknesses and a high aspect ratio. The process creates zeolite nanosheets with enhanced mass transport properties within their nanopores, favorable to applications such as catalysis and separation. The nanosheets feature many desirable characteristics: predominant thickness of 5nm (2.5 unit cells), 0.6 nm straight pores down their thin dimension, and basal dimensions of several micrometers. For example, the material includes a planar layer of MFI zeolite where the planar layer ranges in thickness between 4 nm and 10 nm for at least 70% of a basal area of the planar layer. The direct synthesized nanosheets exhibited superior selectivity and flux compared to the state-of-the-art membranes made with exfoliated nanosheets or conventional crystals.

MN-IP Try and Buy

Try

- Trial period is six months
- Trial fee is $5000
- Trial fee is waived for MN companies or if sponsoring $50,000+ research with the University
- No US patent expenses during trial period

Buy

- $25,000 conversion fee (TRY to BUY)
- Royalty rate of 3% (2% for MN company)
- Royalty free for first $1M in sales

Improved Zeolite Membrane

Previous methods of preparing zeolite nanosheets are time-consuming, costly, low-yield and result in fragmented nanosheets with sub-micrometer lateral dimensions. This direct synthesis method provides a viable path to high-aspect-ratio zeolite nanosheets, with improved yield at a lower cost.

BENEFITS AND FEATURES:

Technology ID
20170075

Category
Engineering & Physical Sciences/Materials
Engineering & Physical Sciences/Nanotechnology

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- Direct synthesis; easier to prepare
- Nanometer thicknesses: between 4 nm and 10 nm for at least 70% of a basal area of the planar layer
- Superior selectivity and flux
- Enhanced mass transport properties within their nanopores
- High aspect ratio
- Higher yield
- Potentially lower cost

APPLICATIONS:

- Zeolite membranes
- Chemical / petroleum separation equipment
- High-performance separation membranes
- Catalysis and separation

Phase of Development - Prototype developed

Researchers

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Publications

Ultra-selective high-flux membranes from directly synthesized zeolite nanosheets
Nature, 543, 690–694 (30 March 2017)