



## Zeolite Nanosheets with Open Pores

**Technology ID**

20160119

### Organic-Free Zeolite Nanosheets

A method of preparing zeolite nanosheets creates nanosheets with open pores, free from organic surface contaminants. This method has successfully prepared large lateral sized zeolite nanosheets with organic molecules removed from the pores. Organic molecules were removed from the micropores by using a piranha solution (sulfuric acid and hydrogen peroxide) as a strong oxidizing solution. These organic-free zeolite nanosheets can be dispersed in water, resulting in a first-ever aqueous suspension of zeolite nanosheets in the absence of any organic.

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### Dispersed in Water

Existing zeolite nanosheets' pores are blocked with organic molecules (organic structure directing agents, or OSDA), and the resulting non-polar surfaces do not allow the nanosheets to be dispersed in water. The zeolite nanosheets made from this method have open pores, with high microporosity, and hydrophilic, so they can be dispersed in water. Previous zeolite nanosheets require high temperature (approx. 300 degrees C) calcination to remove OSDA, but this temperature is too high for polymeric supports. In addition, no methods exist for removing OSDA from multilamellar zeolite or zeolite nanosheets in solution. This technology not only removes organic molecules from micropores using a wet chemical approach at a much lower temperature (under 100 degrees C), but they are obtained as a suspension (in non aggregated form) in water.

**BENEFITS AND FEATURES:**

- Open pores
- Free from organic contaminants
- Can be dispersed in water, eliminating hazardous solvents in coating onto a membrane support
- Improved interlayer adhesion and adhesion to support
- Large lateral size (up to 1000 nm)
- Removes organic molecules at low temperature (< 100 degrees C)
- Removes organic molecules in solution

## **APPLICATIONS:**

- Zeolite membranes for selective separation of small molecules

**Phase of Development** - Prototype developed. Materials synthesized. Selectivity of materials demonstrated.

## **Researchers**

Michael Tsapatsis, PhD

*Professor, Chemical Engineering and Materials Science*

[External Link](http://www.cems.umn.edu) (www.cems.umn.edu)

## **Publications**

[\*Open-Pore Two-Dimensional MFI Zeolite Nanosheets for the Fabrication of Hydrocarbon-Isomer-Selective Membranes on Porous Polymer Supports\*](#)

*Angewandte Chemie International Edition*, April 21, 2016 DOI: 10.1002/anie.201601135

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