Single-walled Zeolitic Nanotubes Discovered

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A new class of nanotube material has been discovered by researchers at Stockholm University together with a research group at the American university GeorgiaTech. The unique mesostructure of nanotube materials provide them with properties that are not available for bulk material.

The carbon nanotube is the most prominent example known so far and exhibits impressive mechanical properties in terms of strength and stiffness in addition to tailorable electrical, optical and thermal properties.

Through a combination of targeted synthesis and high definition structure elucidation, the zeolitic nanotube has been realized. Analogous to the carbon nanotube this material exhibits an extended one-dimensional structure with an ordered wall structure at the atomic-scale. The zeolitic nanotube is however different both when it comes to chemical composition and in atomic structure. It is composed of a microporous wall, which encapsulates a hollow mesoporous core. The tubular morphology and aluminosilicate composition provide a system with intrinsic multi-lengthscale ordering, creating unique properties.

The zeolitic nanotube was synthesized by a process that simultaneously directs the formation of a ~5nm wide tubular mesostructure and a microporous and crystalline wall. Aberration-corrected transmission electron microscopy imaging provided essential tools to reveal the atomic structure, where information from different projections were used in order to reveal its complete atomic structure.

“Electron microscopy provides a unique opportunity to determine the atomic structure of materials lacking three-dimensional periodicity, such as nanotubes”, says Tom Willhammar, researcher at the Department of Materials and Environmental Chemistry (MMK) at Stockholm University.

The discovery was recently published in the scientific magazine Science.

Read the original article on Stockholm University.