NANO HIGHLIGHT

Nano Jelly Rolls: The Atomic Structure of Vanadium Oxide Nanoparticles

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Manufacturing a material with nanometer length dimensions imbues it with special properties coming solely from its small size. This is the basis of nanotechnology [1]. For example, great excitement exists about the properties of hollow carbon nanotubes called buckytubes [2], but can other materials be manufactured into nanotubes and have their properties similarly enhanced? One example is vanadium pentoxide, V₂O₅. In the bulk material is useful in applications such as optical switches, chemical sensors, catalysts and solid-state batteries. In the form of nanotubes these properties are further enhanced, but in addition, completely novel applications such as nanoactuators and nonlinear optical limiters are envisaged [3]. A severe limitation to its full implementation in technology is a lack of knowledge of its atomic scale structure in the nanocrystalline form. This is a generic problem with nanostructured materials since conventional crystallographic methods of structure solution don’t work on the nanoscale. The NSF funded NIRT-Structure of Nanocrystals is addressing this need by developing and applying advanced scattering methods to solve the structure of nanoparticles [4].

Earlier we resolved a long-standing controversy about the atomic structure of nanoporous V₂O₅ xerogel [5] and showed it to be made of flexible layers of edge-shared octahedra. NIRT researchers have now shown [3] that, in the V₂O₅ nanotube, these layers appear to roll up resulting in the nanotube: a nanometer length-scale jelly roll.

References

[4] For further information about this project link to http://nirt.pa.msu.edu/ or email billinge@pa.msu.edu