NANO HIGHLIGHT

Nano Jelly Rolls: The Atomic Structure of Vanadium Oxide Nanoparticles

NSF NIRT GrantDMR-0304391-Structure of Nanocrystals
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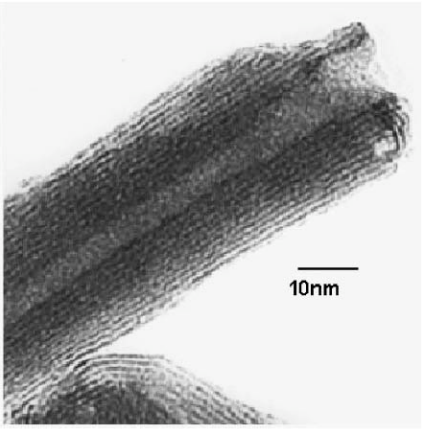
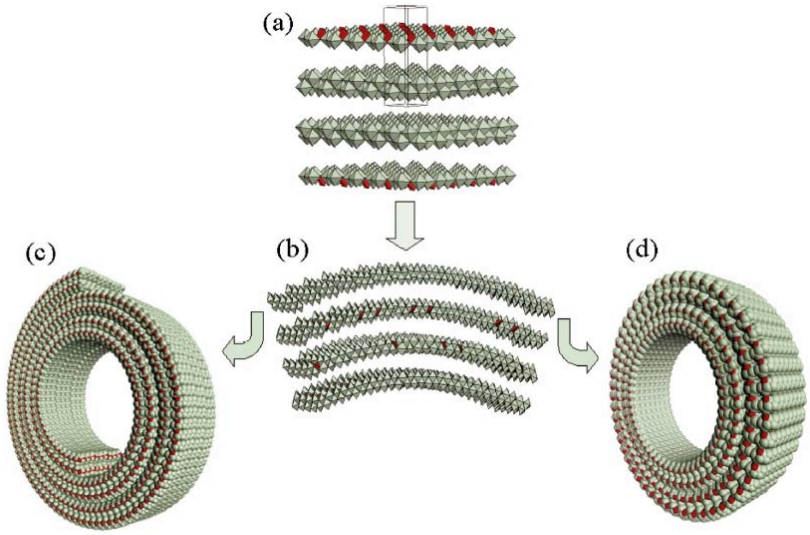
Manufacturing a material with nanometer length dimensions imbues it with special properties coming solely from its small size. This is the basis of nanotechnology [1]. For example, great excitement exists about the properties of hollow carbon nanotubes called buckytubes [2], but can other materials be manufactured into nanotubes and have their properties similarly enhanced? One example is vanadium pentoxide, V_2O_5. In the bulk the 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 V_2O_5 xerogel [5] and showed it to be made of flexible layers of edge-shared octahedra. NIRT researchers have now shown [3] that, in the V_2O_5 nanotube, these layers appear to roll up resulting in the nanotube: a nanometer length-scale jelly roll.

References

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[4] For further information about this project link to **http://nirt.pa.msu.edu/** or email **billinge@pa.msu.edu**
[5] V. Petkov, P.N. Trikalitis, E.S. Bozin, S.J.L. Billinge, T. Vogt and M.G. Kanatzidis, *J. Am. Chem. Soc*. **124**, 10157 (2002).