Vanadium Oxide Nanostructures

Beamline: U7A

Category of Researcher:
NIST PRT

Technique:
NEXAFS Spectroscopy

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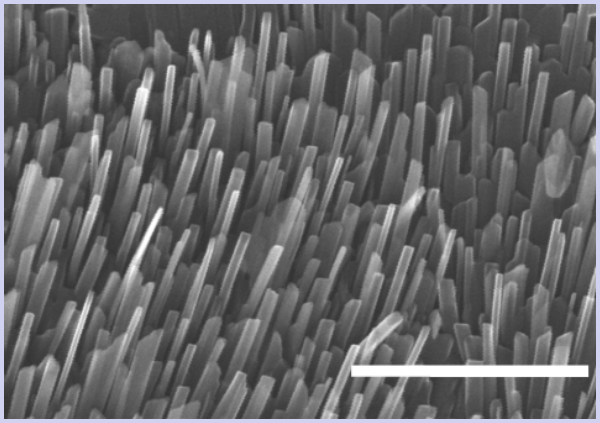
Publication: Synthesis, Structural Characterization, and Electronic Structure of Single-Crystalline $Cu_xV_2O_5$ Nanowires, *Inorg. Chem.* accepted (2009)
NEXAFS Studies of Single-Crystalline V_2O_5 Nanowire Arrays, *J. Phys. Chem.* submitted (2009)

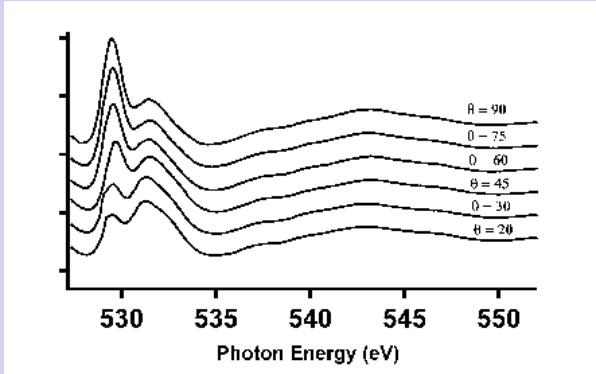
Motivation:

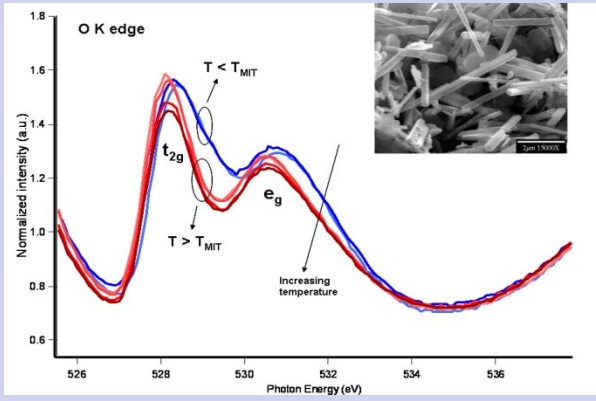
The facile accessibility of different oxidation states and the high tolerance for defects makes vanadium oxide nanostructures attractive candidates for microelectronics applications as power sources (V_2O_5), switching elements (VO_2), and superconducting leads ($Cu_xV_2O_5$). We use solution and CVD-based methods to prepare VO_2, V_2O_5, and $Cu_xV_2O_5$ nanowires and nanowire arrays.

Results:

NEXAFS spectroscopy at the O K-edge enables the study of the electronic structure of VO_2 nanowires across the thermal metal—insulator phase transition and provides insight into changes in the band structure. NEXAFS spectroscopy is also used to probe the electronic structure, alignment, and uniformity of crystal growth direction of V_2O_5 nanowire arrays that are being implemented as high power and energy density cathode materials for Li-ion batteries.







SEM image of V_2O_5 nanowire array (top), polarization-dependent O K-edge NEXAFS spectra of the nanowire array sample (middle), and temperature-dependent NEXAFS spectra of VO_2 nanowires across the metal—insulator phase transition showing a clear change in band structure.