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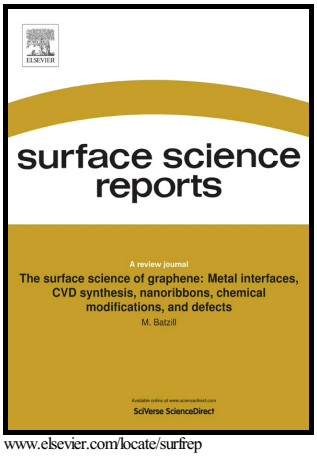

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Atomic Scale Characterization and Surface Chemistry of Metal Modifided Titanate Nanotubes and Nanowires

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Abstract

Titanates are salts of polytitanic acid that can be synthesized as nanostructures in a great variety concerning crystallinity, morphology, size, metal content and surface chemistry. Titanate nanotubes (open-ended hollow cylinders measuring up to 200 nm in length and 15 nm in outer diameter) and nanowires (solid, elongated rectangular blocks with length up to 1500 nm and 30-60 nm diameter) are the most widespread representatives of the titanate nanomaterial family. This review covers the properties and applications of these two materials from the surface science point of view. Dielectric, vibrational, electron and X-ray spectroscopic results are comprehensively discussed first, then surface modification methods including covalent functionalization, ion exchange and metal loading are covered. The versatile surface chemistry of one-dimensional titanates renders them excellent candidates for heterogeneous catalytic, photocatalytic, photovoltaic and energy storage applications, therefore, these fields are also reviewed.

Keywords

Titania, titanates. Oxide surfaces, semiconductors, metal nanoparticles, Fermi energy, band gap energy. X-ray photoemission spectroscopy, UV-vis spectroscopy, Raman spectroscopy. Transmission electron microscopy, scanning tunneling electron microscopy, X-ray diffraction

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