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generated oxygen species react with the Ti atoms on the surface of the Ti foil to form TiO2 nanowires. Afterwards, the carbon species are coated in situ on the surface of the TiO2 nanowires to form the core-shell nanostuctures. Since the Ti foil serves as the source of Ti and substrate, synthesis of TiO2/C Core-shell nanowires and their quasi-aligned assembly on a conductive Ti substrate are accomplished in one step. Consequently, good intrinsic adhesion and electrical contacts are achieved naturally between the core-shell nanowires and metal substrate. This configuration bodes well for applications to photoelectrical devices such as field emission. In comparison with the pure TiO2 nanowire arrays, the TiO2/C core-shell nanowire arrays have enhanced field emission properties due to the carbon coating, as demonstrated experimentally and reported here. The field emission of the TiO2/C core-shell nanowire arrays exhibits the conventional Fowler–Nordheim behavior and good emission stability, suggesting potential applications of the materials in vacuum microelectronics.

[ID-4512] Large-scale Synthesis of Mullite Nanowires by Molten Salt Method
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Abstract:
Mullite (3Al2O3·2SiO2) has good chemical stability, low thermal expansion coefficient, high deformation resistance at high temperature, and low fracture toughness. Together with the low dielectric constant and dielectric loss, the materials are widely used in electronic and optical devices such as mid-infrared windows and high-temperature structure ceramics. Whisker-like mullite nanostructure may have enhanced properties due to their high aspect ratio and large surface area. In this work, single-crystalline mullite nanowires are produced in large quantities by a simple and facile molten salt method. The raw materials are aluminum sulfate and silica, which are reacted in molten medium such as NaCl-KCl, KCl, Na2SO4 or K2SO4 at 900-1300°C to produce mullite nanowires without using any surfactants or templates. After the synthesis, the remaining salts are easily separated from the products by washing with water. The final products are characterized by X-ray powder diffraction, field emission scanning electron microscopy, transmission electron microscopy, high-resolution TEM, X-ray photoelectron microscopy, energy-dispersive X-ray spectrum, and selected-area electron diffraction. The diameters of the nanostructures are 50–80 nm and their lengths are up to a few micrometers. Raman spectroscopy and photoluminescence are used to disclose their optical properties. The influence of the different molten medium on the morphology of the final product and growth mechanism are investigated. The potential technological importance of the product, simplicity of the preparation procedure, as well as cheap precursors (aluminum sulfate and silica) makes this study scientifically and technologically interesting.

[ID-4530] The crystallized mechanism and the optical properties of ZnO nanowires prepared by the sol-gel method
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Abstract:
The ZnO thin films were prepared on quartz glass by sol-gel method. The thin films were crystallized at 600°C and 700°C for 1 hour under in a pure oxygen atmosphere then analyzed by X-ray diffraction (XRD), scanning electron microscopy (SEM), Raman spectra and photoluminescence (PL). The results show that both of the ZnO films were polycrystalline and correspond to hexagonal structures. Due to the residual zinc atoms combined with oxygen atoms and higher crystallized temperature, the ZnO nanowires grown from the fine grain boundaries on the surface. With increasing the crystallized temperature from 600°C to 700°C, the crystallization of ZnO thin film not only was improved, but also the ZnO nanowires obviously grown on the grain boundaries and the length was around ~190 nm. Raman intensity of the thin film with ZnO nanowires had increased with increasing the crystallized temperature. In addition, increasing the amount of ZnO nanowires not only reduce the effect of grain growth, but also improved the physical properties of thin films.