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Metal-insulator Transition of VO2 Thin Films and Nanowires Induced Photo-excitation

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VO2 exhibits metal-insulator transition (MIT), of which critical temperature (TC) is about 340 K. There have been many reports that MIT can be induced by UV light as well as heat. Clear mechanism regarding such photo-induced MIT has not been clarified. We have compared the MIT behaviors of VO2 thin film during heating-cooling cycles with and without light. We tried several light sources with different wavelengths (red, blue, and UV). Tc and hysteresis width of the resistance change were influenced by the illumination of the samples. We performed Kelvin probe force microscopy (KPFM) studies, which can reveal the evolution of the local sample work function. In this presentation, we will discuss possible physical origins for the photo-induced effects on the MIT behaviors of the VO2 samples.

Keywords: VO2, MIT, photo-excitation

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Novel Method to Confine Manganese Oxide Nanoparticles in Polyaniline Hollow Nanospheres and Its Supercapacitive Properties

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Nanostructuring the electrode surface is an emerging technology to improve the performance of supercapacitors since it can facilitate charge transfer, ion diffusion and electron propagation during electrochemical process. Fabrication of the electrode consisting of two or more materials together has also been focused on since it can provide synergetic effect such as broader working potential range and enhanced capacitance. In this work, we have used polyaniline (PANi) and manganese oxide (MnO2) as electrode materials. PANi is one of the promising electrode materials due to its high electrochemical activity, high doping level and stability. MnO2 is also widely studied material for supercapacitors since it is relatively cheap and environmentally friendly. Firstly, we synthesized polystyrene nanospheres on MnO2 nanoparticles. MnO2-incorporated PANi hollow nanospheres were then fabricated by polymerizing aniline monomers on these PS nanospheres and dissolving the inner PS spheres. The surface morphology, electronic absorption and electrical conductivity of the electrode were analyzed using field-emission scanning electron microscope (FE-SEM), UV-visible spectrometer, and sheet resistivity meter, respectively. The electrochemical properties such as capacitance of the supercapacitors were also estimated using cyclic voltammetry.

Keyword: Polyaniline