Characterization of VO₂ Structures Performed by Electrodeposition

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Abstract – VOₓ particles were deposited onto p-doped Si (100) substrates using potentiostatic electrodeposition. By vacuum annealing (3 hours at 450 °C, pressure of 10⁻⁷ mbar), we obtained polycrystalline VO₂ particles (Fig. 1).

We report on the structural and electronic properties of vanadium oxide (VOₓ) particles prepared by potentiostatic electrodeposition on Si(100) substrates. Different properties can be observed as a function of the phase vanadium oxides. Among the transition metal oxide semiconductors, vanadium dioxide, especially in thin film form, has attracted considerable interest over the years owing to their wide range of applications. Vanadium dioxide (VO₂) has a thermal-induced semiconductor-to-metal transition at 68°C [1]. Below his transition temperature, it is a narrow gap (0.7 eV) semiconductor. In this work vanadium oxide particles were obtained from aqueous vanadium (IV) oxide sulfate hydrate (VOSO₄.xH₂O) solutions at cathodic potential (-0.75 V versus Ag-AgCl reference electrode) with 1.5 h of deposition. According to x-ray diffraction (XRD) the as deposited samples consist of polycrystalline VOₓ particles. For this reason the samples were annealed at a pressure of 10⁻⁷ mbar for 3 hours at 450 °C. The XRD results for annealed samples show that the vanadium oxide particle change from VOₓ to VO₂ (Monoclinic, Space Group C2/m, Card Number: 76-673). Analyses of Scanning Electron Microscope (SEM) show microstructures with different sizes in the same sample (Fig. 2).

References:
