Using a Scalable Atmospheric-pressure Vapor Transport Strategy for the Growth of VOx Nanowires in Energy Efficient Commercial Applications

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Smart materials' are among the very promising candidates for a tremendous number of potentially beneficial technological applications. One of the most promising metal oxide families is vanadium oxides nanowires (VOx NWs). Reversible Metal-to-Insulator Transition allows for these nanowires to exhibit adaptive optical and electrical properties that can be exploited for energy efficiency. The purpose of this project is to propose a scalable procedure for the synthesis of VOx NWs with con-trolled composition, shape and density. Pulsed laser deposition (PLD) was used to synthesize VOx NWs with valid quality. However, the cost of PLD synthesis is not conducive to large-scale produc-tion. Therefore, experimental studies were carried out to control the synthesis of VOx NWs using a scalable process, namely atmospheric-pressure vapor transport process. V2O5 powder (99.995% Alfa Aesar) was used as the source material. It was placed in a ceramic boat, upstream from Si sub-strates inside a quartz tube. Argon carrier gas was introduced at controlled flow rate of 100sccm. The furnace temperature was increased up to 900 °C and kept constant for 30 minutes. Subsequent-ly, the furnace was left to cool down to room temperature. The samples were systematically charac-terized using X-ray Diffraction, X-ray Photoemission Spectroscopy and Scanning Electron Micros-copy. SEM images will display that nanowires were grown with a specific aspect ratio. This present work represents an important advance in the large scale synthesis of VOx NWs towards their use in energy efficient devices. The can include smart windows in homes, automobiles and aircraft.