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Characterization of thermochromic VO2 films obtained by the oxidation of sputter-deposited thin films in a semi-industrial machine

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VO_2 is a widely studied thermochromic material, which exhibits a metal-insulator transition approximately at 68°C, accompanied by a crystallographic transition from a low temperature monoclinic phase to a high temperature tetragonal rutile structure. Optical and electrical properties also change drastically with phase transition of VO_2 and make this material convenient for several applications, such as near-infrared modulation in smart windows, thermal solar collectors, ultrafast electronic devices and so many others. Nevertheless, elaboration of VO_2 films with good thermochromic properties still remains a challenge because is mandatory to avoid other intermediate phases belonging to the vanadium-oxygen system [1]. In this work thin films were reactively sputter-deposited on Al substrates by using an in-line semi-industrial machine. The films of 150 nm thickness followed an annealing process performed at different times and three different temperatures in the range of 450°C-550°C. X-ray diffraction, Raman spectrometry and Secondary ion mass spectrometry were performed for structural characterizations and qualitative elemental depth profiles of the oxidized films. The thermally-induced properties of the oxidized films were analyzed in term of their optical properties by infrared camera. The wide range of time and temperatures during the annealing process together with the characterization techniques used, allow us to find the accurate parameters to synthesize thermochromic VO_2 films. [1] X. Xu, X. He, G. Wang, X. Yuan, X. Liu, H. Huang, S. Yao, H. Xing, X. Chen, J. Chu, Applied Surface Science 257 (2011) 8824-8827.

Keywords
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