Study of V-O and Cr-O films by x-ray photoelectron spectroscopy

Ezhil Manoharan, Xing Zhong, Manjit Pathak, Patrick R. LeClair, and Gary J. Mankey
Center for Materials for Information Technology (MINT)
Department of Physics & Astronomy
University of Alabama
Tuscaloosa, AL, U.S.A.

Some vanadium-oxygen materials such as VO_2 undergo metal-insulator transitions. This process is often followed by sudden change in magnetic properties at a critical temperature. The metal-insulator transition temperature of VO_2 is slightly above room temperature [1]. This transition is accompanied by a structural transition from a low temperature monoclinic phase to a high temperature rutile phase, and sharp increase in resistivity by10^3 to 10^4 times. Due to this property, VO_2 is used in IR sensors and thermal-shield glass coating. CrO_2 is a ferromagnetic half metal which means it behaves as a metal for majority spins and as an insulator for minority spins. This property suggests applications as sensors because one can achieve very large resistance changes in magnetroresistance sensors for parallel and anti-parallel spin configurations.

Metal oxides like V-O and Cr-O can be grown on substrates such as TiO_2 and the growth mode influences the physical properties [2]. Samples are grown using CVD method using CrO_3 as precursor on a TiO_2 substrate. The aim of this investigation is to study the properties of V-O and Cr-O films on TiO_2 substrates using X-ray Photoelectron Spectroscopy (XPS) [3, 4, 5]. We will use the Kratos AXIS 165 Multitechnique Electron Spectrometer for our study. XPS is a quantitative spectroscopic technique that analyses the average surface chemistry of the topmost layers of a sample up to a depth of few nanometers. This technique determines the elemental composition, atomic concentrations and chemical states of elements present in the selvage region of a surface.

References

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