On the growth and properties of thin Vanadium layers: V/MgO(100)

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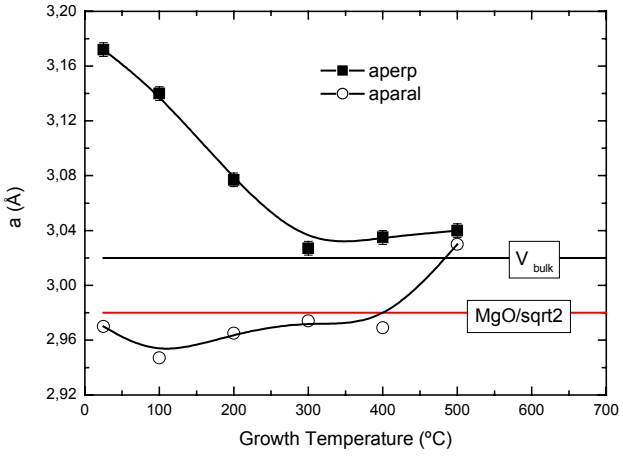
Abstract

Despite that vanadium is a non magnetic element, it is not clear whether the clean V(100) surface is magnetic or not and how an induced magnetic moment appears when V is in contact with ferromagnetic elements like Fe and Co [1,2]. Fundamental studies of such intriguing phenomena are very dependent on the crystallography and morphology of the V nanostructures and layers [3].
In this work, we present the study of the growth of thin vanadium layers (40 Å) on MgO(100). The V layers have been grown at different temperatures by triode sputtering on a freshly MgO layer deposited on MgO(100) wafers by laser ablation. Results on the morphology of the surface layers investigated using Atomic Force Microscopy and on the crystallographic order determined using X-ray diffraction are presented as a function of the growth conditions. In particular, we show that the V out-off-plane lattice parameter (aperp, see figure) is very sensitive to the growth temperature in contrast to the in-plane lattice parameter (aparal). Complementary information on the resistivity and electronic structure of the V deposits (measured with X-ray photoemission spectroscopy) is also presented. We show that the crystallographic structure and the resistivity of the thin V layers are very dependent on the growth temperature. The observed excellent crystallographic quality of the thin V layers opens new opportunities to study the intriguing phenomena such as induced magnetism on vanadium.



1. A. Scherz et al., Physical Review B **68**, 140401 (2003).
2. Y. Huttel et al., Physical Review B **68**, 174405 (2003).
3. Y. Huttel et al., Physical Review B **67**, 052408 (2003).