LMGP
Laboratoire des matériaux et du génie physique
une vision des matériaux

2016-2017

Internship proposal (Master or final project engineering school) at LMGP Lab.

Study of the deposition condition of Vanadium oxide thin films as key material for the next generation communication network

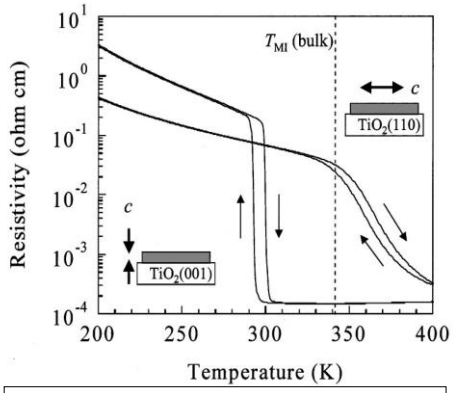
Abstract

For the realization of RF components of the future, the internship focuses on the study of the deposition by CVD of VO_2 thin films and especially on the optimization and control of its metal insulator transition related to the deposition conditions and the type of substrate used to achieve the growth.

Context

In the field of radio frequency communications, ultra fast switching is a crucial issue for the development of communication networks with very high flow mobile connection. This function is currently performed by using components primarily for MEMs. Due to the mechanical displacement which is implemented, the switching times are limited to values of the order of millisecond. Also to exceed this limit and realize ultrafast RF switches, using the metal insulator transition of certain compounds is a promising solution.

In this context the project aims to explore the development of thin layers VO_2 vanadium oxide in its monoclinic phase, which has a very marked conduction transition over three orders of magnitude between the insulating state and a metallic state when it passes over 300K (see figure).



Temperature dependence of résistivity for VO_2 films deposited on TiO_2 (001) and TiO_2 (110) [Appl. Phys. Lett. 80, 583 (2002)]

Project description

The deposition of thin layers of VO_2 will use a chemical vapor deposition reactor (MOCVD). The work will establish the correlation between the experimental deposition conditions (deposition temperature, gas flow, concentration of precursor) and the microstructural and physicochemical properties of the deposited layers. The characterization of the thin films will appeal to a wide range of techniques such as the scanning electron microscopy, X-ray microanalysis or atomic force microscopy to determine the morphology and composition; also such as the X-ray diffraction, infrared or Raman spectrometry to determine the microstructure as well as electrical measurements to determine the characteristics of the metal-insulator transition. As this transition is also related to a structural change, it will also be studied in situ versus temperature by X-ray diffraction and Raman spectrometry analysis. The characteristics of the transition will be considered depending on the type of substrates used in correlation with the resulting growth type. Finally the optical activation of the transition of certain samples will be studied as part of a collaboration with the Thales Research Technology center in Palaiseau.

.Location

The candidate will work within the LMGP, Materials and Physical Engineering Laboratory, in the group FM2N in collaboration with Thales Research Technology at Palaiseau.
LMGP Web Site: http://www.lmgp.grenoble-inp.EN/

Profile & requested skills

The candidate is a high school, engineering school and / or Master student whose training focuses primarily on materials science. Aptitude for teamwork, good spoken and written English will be appreciated. We are looking for dynamic students, motivated and interested in pursuing with a PhD.

Subject could be continued with a PhD thesis : YES

Internship stipend: 554€ per month.

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