2021-2022

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

$LaSrVO_3$ films as a transparent p-type semiconducting oxide with enhanced performances for transparent electronic.

Abstract

For the development of new efficient P type TCO thin films as key step toward transparent electronic, the internship focuses on the study of the deposition by CVD of $LaSrVO_3$ thin films and especially on the control of its optical and electrical properties related to the deposition conditions.

Context

Oxide electronics, also referred to as transparent electronics, is an important emerging area, notably for the development of thin film transistors (TFTs) and more complex electronic circuits. The significant research interest in this field has been spurred by the enormous success of n-type oxide semiconductors, specially amorphous oxide semiconductors, in particular gallium-indium-zinc oxide ($InGaO_3(ZnO)_5$, or GIZO). The successful application of n-type oxides to TFTs has motivated the interest in p-type oxide based semiconductors also to be applied to TFTs or to complementary metal-oxide semiconductor (CMOS) technology. However, until now there is a lack of p-type oxide semiconductors with performance similar to that of n-type oxide. In fact, for p-type oxides, the carrier conduction path (valence band) is mainly formed from the oxygen *p* asymmetric orbitals. However, due to the ionicity of the metal-oxygen bond in most of metallic oxides, this leads to the formation of a deep acceptor level which limits the hole mobility. As new class of TCO material, strong correlated electron phase appear as promising candidates as p-type transparent semiconductors.

Project description

Within this context, the internship focuses on the study of the deposition of $LaSrVO_3$ (SVO) thin films by metal-organic chemical vapor deposition (MOCVD). The optimization of the growth conditions will be performed by a detailed characterization study using a wide range of standard physicochemical analysis techniques (X-ray diffraction; scanning and transmission electron microscopy; energy and wavelength-dispersive X-ray microanalysis , Fourier-transform infra-red and Raman spectroscopies). Transparent p-n junction devices will be subsequently fabricated by depositing the SVO films on well-known n-type layers such as Al:ZnO or F:SnO_2, and their transport properties as well as their optical transmittance will be analysed.

Scientific environment The candidate will work within the LMGP, Materials and Physical Engineering Laboratory, in the FunSurf group (Functional thin films and surface nanoingineering). Located in the heart of an exceptional scientific environment, the LMGP offers the applicant a rewarding place to work.
LMGP Web Site: http://www.lmgp.grenoble-inp.fr/

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 allowance: Internship allowance will be provided (approx. 550 € /month).

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