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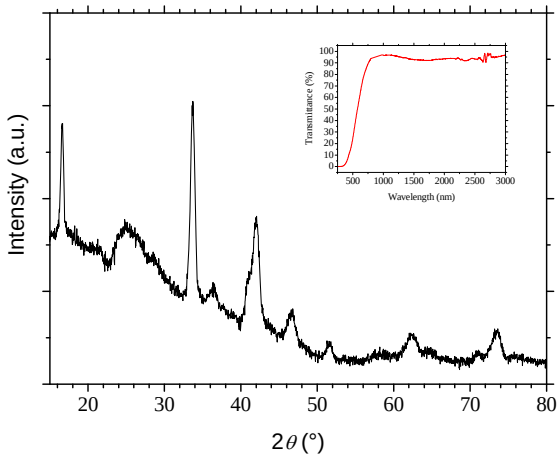
Erasmus Mundus

DocMASE Project Proposal 2012-06

Project Title	***Copper based oxide films for transparent p-n junctions***
Main University and Advisor	**Institut National Polytechnique de Lorraine** (Nancy, FRANCE) Dr. Jean-François PIERSON
Second Univ. and Advisor	**Saarland University** (Saarbrücken, GERMANY) Prof. Frank Mücklich
Associated Partner(s)	**Pontificia Universidad Católica de Chile** (Santiago, CHILE) Dr. Esteban Ramos
Project Description	ITO, SnO_2:F or ZnO:Al are well known as n-type conducting materials. On the other hand p-type transparent conducting oxides in thin film form were described for the first time in 1997 [1]. The deposition of p- and n-type layers on transparent substrates opens the way towards transparent microelectronics. Our group already has a strong experience on ZnO:Al film deposition [6-8]. Within the objective to synthesise transparent p-n junctions, it is necessary to develop a process for the deposition of p-type transparent conductors. The oxides that crystallise in the delafossite-like structure are the most promising p-type conductors. This structure is observed for materials with the following formula: ABO_2 where A = Cu, Ag, Pd, Pt and B = Fe, Cr, Al, Y, Sc, La, In, Nd. In the literature, the delafossite-like oxides are usually deposited by the non-reactive sputtering of an oxide target [2-4]. Although the co-sputtering process in reactive mode may allow a better composition of the deposited films, this method is scarcely used [5]. This project aims to study the influence of the deposition conditions on the structure, the optical and the electrical properties of delafossite-like films deposited on glass and polymeric substrates by reactive sputtering. The metallic targets will be sputtered either using pulsed-DC or HIPIMS generators. During the third year, transparent p-n junctions will be elaborated.  *X-ray diffractogram and optical transmittance of a delafossite-like film.*
References	[1] H. Kawazoe et al., *Nature* 389 (1997) 939 [2] Min Fang et al., *Appl. Surf. Sci.* 257 (2011) 8330 [3] A. Barnabé et al., *Mater. Lett.* 60 (2006) 3468 [4] Guobo Dong et al., *Vacuum* 82 (2008) 1321 [5] Hong-Ying Chen et al., *Thin Solid Films* 519 (2011) 5966
Previous Publications	[6] D. Horwat, A. Billard, *Thin Solid Films* 515 (2007) 5444 [7] D. Horwat et al., *J. Phys. D: Appl. Phys.* 43 (2010) 132003 [8] M. Jullien et al., *Solar Energy Mater. Solar Cells*, 95 (2011) 2341