



	<b>Experiment title:</b> X-ray absorption spectroscopy of a solution-processed oxide semiconductor as a function of thermal annealings	<b>Experiment number:</b> 30-02-1068
<b>Beamline:</b> BM30B	<b>Date of experiment:</b> from: 07/03/ 2014 to: 11/03/2014	<b>Date of report:</b> 12/01/2016  <i>Received at ESRF:</i>
<b>Shifts:</b> 12	<b>Local contact(s):</b> Olivier Proux	
<b>Names and affiliations of applicants</b> (* indicates experimentalists): Dr. Christine Revenant* - CEA/Grenoble, INAC/SP2M Dr. Mohammed Benwadih* - CEA/Grenoble, LITEN/DTNM		

## Report:

### Abstract:

We study by X-ray absorption spectroscopy the local structure around Zn and Ga in solution-processed In–Ga–Zn–O thin films as a function of thermal annealing. Zn and Ga environments are amorphous up to 450 °C. At 200 °C and 450 °C, the Ga atoms are in a  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> like structure, mostly tetrahedral gallium oxide phase. Above 300 °C, the Zn atoms are in a tetrahedral ZnO phase for atoms inside the nanoclusters. The observed formation of the inorganic structure above 300 °C may be correlated to the rise of the mobility for IGZO TFTs. The Zn atoms localized at the nanocluster boundary are undercoordinated with O. Such ZnO cluster boundary could be responsible for electronic defect levels. Such defect levels were put in evidence in the upper half of the band gap.

### Publication:

Local structure around Zn and Ga in solution-processed In–Ga–Zn–O and implications for electronic properties,

Christine Revenant, Mohammed Benwadih, and Olivier Proux

Phys. Status Solidi RRL **9**, No. 11, 652–655 (2015) .