Fluorescence EXAFS data were collected on the dedicated chamber operative at the GILDA beamline. The monochromator was equipped with a Si(111) crystal pair and was run in dynamically focusing mode. The rejection of higher order harmonics was achieved by using a pair of Pt mirrors with an energy cutoff of 10 keV. X-ray fluorescence of the samples was measured by means of a thirteen elements Ge detector.
The samples were obtained according to the following protocol:
i) Sputtering in vacuum (10^{-2} mbar) of ZnO onto an Al_2O_3 single crystals (11-20), (0001) and (1-102) at Room Temperature (RT). The layer thickness was checked by X-ray reflectivity and resulted to be 150 Å. The chemical state of the layer was checked by X-ray diffraction and resulted to be metallic ZnO.
ii) Firing of the ZnO layer with the substrate. The treatments were carried out at 300°C for 20 minutes and 800°C for different amount of time in air.
For comparison purposes the EXAFS spectra in conventional transmission mode of ZnO and $ZnAl_2O_4$ powders were also collected.

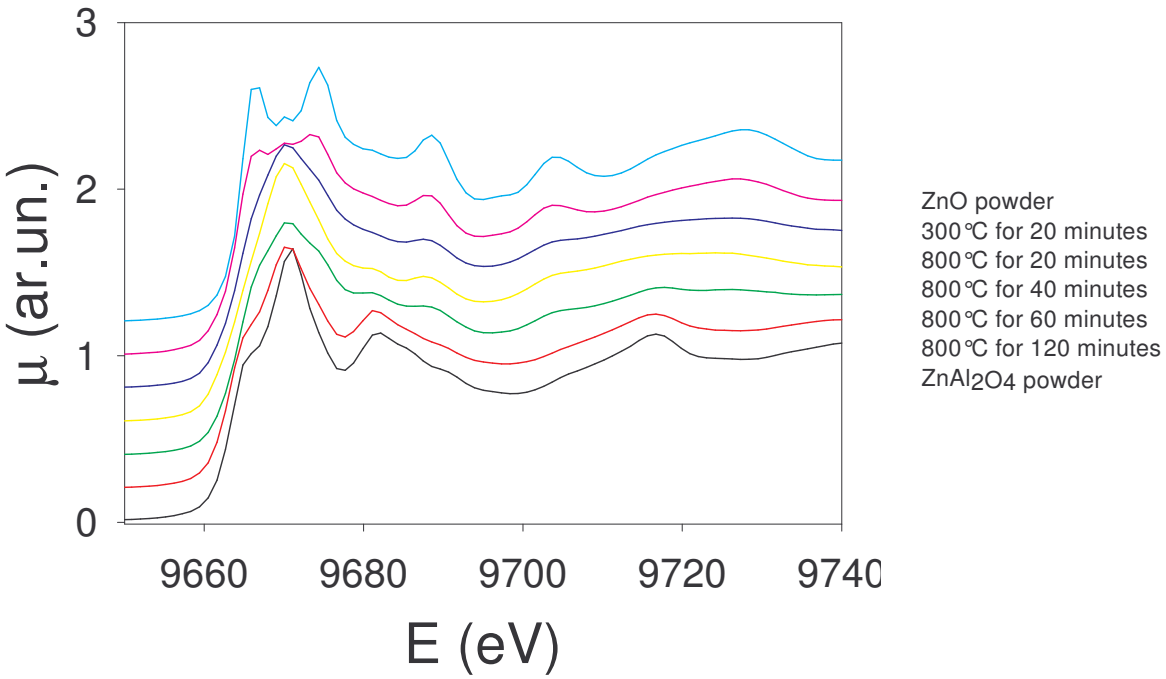

Figura 1: Zn K-edge XANES spectra of ZnO onto Al_2O_3 (11-20) single crystal after different treatments. For comparison purposes the inset also shows the spectra of ZnO and $ZnAl_2O_4$ powders.

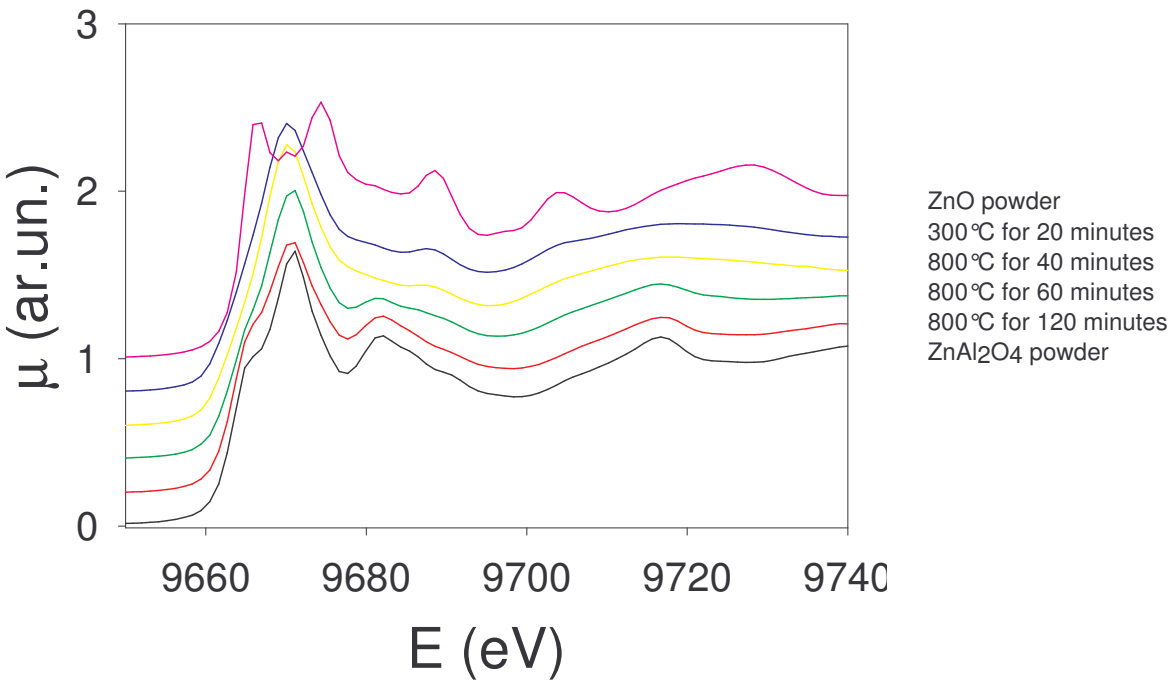

Figura 2: Zn K-edge XANES spectra of ZnO onto Al_2O_3 (0001) single crystal after different treatments. For comparison purposes the inset also shows the spectra of ZnO and $ZnAl_2O_4$ powders.

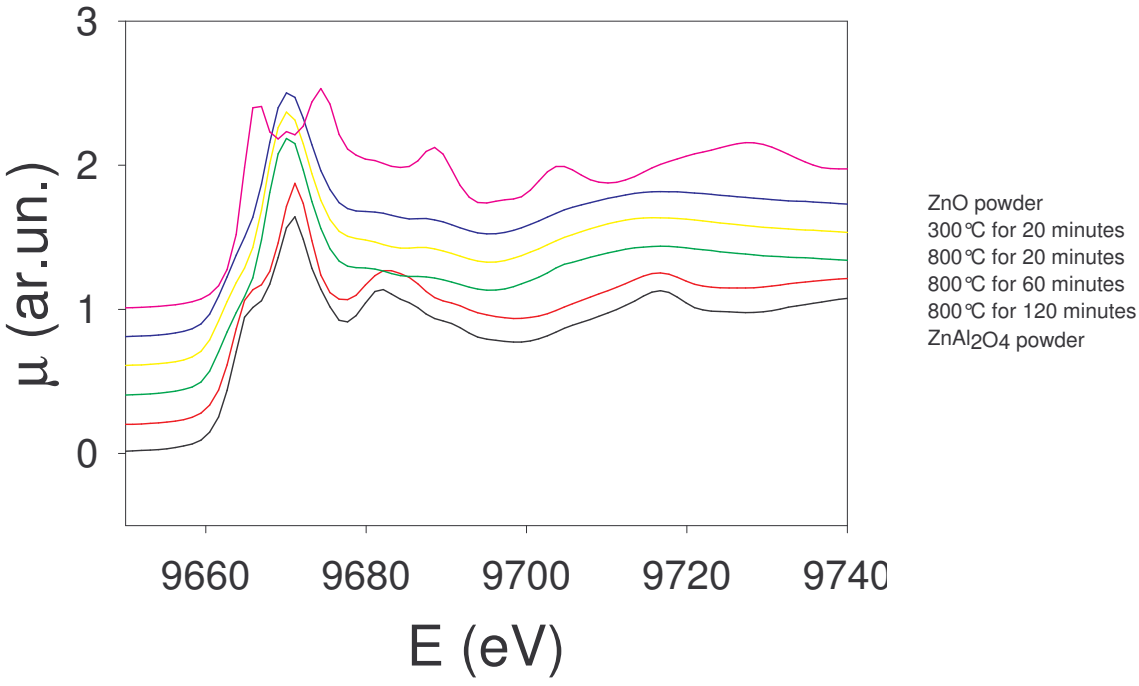

Figura 3: Zn K-edge XANES spectra of ZnO onto Al_2O_3 (0001) single crystal after different treatments. For comparison purposes the inset also shows the spectra of ZnO and $ZnAl_2O_4$ powders.

The most striking result that can be easily observed looking at figures 1 – 3 is that differently oriented Al_2O_3 single crystals show impressive different reactivity towards ZnO. In particular:

1) (11-20) orientation: at 800 °C the spinel is formed and the amount of spinel increases with time, the sample appearing totally reacted after 2 hours at 800 °C.

2) (0001) orientation: at 800 °C a chemical reaction takes place, the product of which is different from both the spinel and ZnO. At the moment the chemical nature of this product has been not yet identified.

3) (1-102) orientation: The behaviour of this orientation is strongly resembling of that previously described for the (0001) orientation.

4) In addition, linear dichroism measurements at the Zn K-edge for the samples treated at 300°C showed that the ZnO thin film is highly oriented when deposited onto Al_20_3 (11-20) and (0001) surfaces (the orientation of the film is with the c-axis of the wurtzite crystal structure perpendicular to the surface), while onto the Al_20_3 (1-102) surface a polycrystalline film is formed.