
Experiment Title Thickness measurements of BiFeO₃ thin films using Ion
Beam Analysis

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Short presentation of the scientific project

BiFeO₃ thin films have become attractive nanostructures because of their potential applications in a new generation of multifunctional devices. The samples that we want to analyze are: Strontium doped and pure BiFeO₃ thin layers deposited on silicon substrate using liquid precursors and dip coating technique. In order to have a more complete characterization of the obtained materials and their quality along with conventional techniques nuclear methods will be used. The thicknesses of the deposited layers will be evaluated by Rutherford Backscattering Spectrometry (RBS) techniques.

BFO samples will be obtained at the Institute of Physical Chemistry of the Romanian Academy.

The presence of impurities in this material may have undesirable effects on electrical properties, mechanical and chemical properties. Because of this situation, analytical techniques of ion beam energy of the order of MeV based on nuclear physics processes have been developed to obtain quantitative elemental analysis. The technique of Rutherford Backscattering Spectroscopy (RBS) is very useful and powerful because it is a non-destructive analysis of thin layers up to thicknesses of more or less than 10⁻⁶m. Because RBS is a fully quantitative method (no need for standards) and data analysis is relatively simple: spectrum acquired and related software what we want to obtain is:

-measure stoichiometry and thickness of thin films;

-presence of impurities using PIXE (Proton Induced X-ray Emission) method associated with the fabrication method. In order to obtain BFO type structures with properties as close to the requirements of material producers we also seek to determine possible impurities;

The nondestructive, quantitative, and rapid IBA measurements are very useful to develop and optimize growth protocols in respect to film thickness and stoichiometry.

We request a total time of 5 days of beam time.

Beam time request(unit=8 hours) : 15
Desired Period : 01.11.14/28.03.15

Desired beam properties

Type : He, p
Energy(MeV) : 3
Intensity(p/nA) : 10
Vacuum Requests : 10e-6 mbar

Special requirements for detectors, electronics,aquisition system

Minimal information needed for the radiological risk evaluation:

- a)Source activity : -
b)Use of open sources :
c)Estimate of the residual activity as a result of irradiation : -
d)Means of storage/transportation for irradiated targets : -

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