GRAZING INCIDENCE X-RAY FLUORESCENCE ANALYSIS IN SHALLOW DOPANT DISTRIBUTIONS AND THIN FILMS CHARACATERISATION

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Grazing incidence X-Ray Fluorescence Analysis is a sensitive technique for elemental analysis which exploits phenomena originating from the interference of the primary beam with portions of it reflected at interfaces and due to absorption, resulting in an angular dependence of the fluorescence signal, to gain information on the depth distribution of the elements detected. When coupled to X-Ray Absorption Spectroscopy, chemical and/or structural information can also be obtained.

A review of the technique and recent applications in semiconductor science for present CMOS technology will be presented and discussed. In particular the capabilities and limits of the technique in terms of sensitivity versus depth, depth resolution, physical model approximations and high concentration doping will be outlined.

Superficial arsenic distributions in silicon for the fabrication of Ultra shallow junctions as needed for current CMOS technology have been characterised. Plasma Immersion Ion Implantation and pulsed laser annealing were used for the doping process and damage recovery respectively. Results of laboratory based GIXRF analyses and XAS measurements carried out at the National Synchrotron Light Source (NSLS) and the Stanford Synchrotron Radiation Lightsource (SSRL) will be discussed.