Conférence invitée

ANALYSIS OF LIGHT ELEMENTS IN SEMICONDUCTOR MATERIALS: TIME-OF-FLIGHT/ENERGY ELASTIC RECOIL DETECTION ANALYSIS

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Of all ion beam analysis techniques, Rutherford backscattering spectrometry is best-known to the general research community; it is capable to quantify heavy elements near the surface in absolute terms and without the need for reference samples. It allows one to characterize the composition of materials with an outstanding accuracy.
Selected other ion beam analysis techniques have shown great promise to characterize light elements in the material, down to and including hydrogen. The experienced ion beam analyst will select an optimized experimental approach for the problem at hand, ranging over EBS, NRA, PIGE, He-ERD, ... While the selected approach is sometimes extremely sensitive towards one element, it is not always generally applicable for other elements.
The recent introduction of a wide spectrum of new compounds containing light elements into the semiconductor industry poses a grand challenge, but also a great opportunity, to the ion beam analysis community. Indeed, in the last decades we are witnessing the introduction into the semiconductor technology of more and more materials that contain light elements. And it is often the light element (H, Li, B, C, N, O...) that determines the functional properties of the compound in the semiconductor device. Therefore, the accurate characterization of all light elements is key. As a versatile approach, we have adopted Time-of-Flight/Energy (ToF-E) heavy-ion elastic recoil detection (ERD) analysis for the composition analysis of light elements near the surface of semiconducting materials.
We will present the principles and practical arrangements for ToF-E elastic recoil detection analysis. We will illustrate the strengths and limitations of ToF-E elastic recoil detection through selected examples. Thereby, it is hoped that we can present ToF-E elastic recoil detection analysis as a versatile and complementary method to quantify the elements near the surface.