

29: Introduction to Time of Flight Secondary Ions Mass Spectrometry (ToF-SIMS)

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Time of Flight Secondary Ions Mass Spectrometry (ToF-SIMS) is a technique used in various fields for a wide range of solid materials (semiconductors, alloys, polymers, oxides...). It detects all ionisable elements in the periodic table, including light elements such as hydrogen with a high sensitivity. It relies on a primary ions beam sputtering the surface of a solid sample in ultra-high-vacuum (UHV), producing secondary ions that are collected in a ToF analyser. Mass spectra are obtained, allowing the identification of species that were adsorbed onto the surface or from the solid. Scanning the primary beam over provides an ionic cartography. Additional erosion with a dedicated beam allows depth profiling, therefore building 3D maps with chemical information. It can be applied to visualize complex structures with an expectable depth resolution in the nanometre range and a lateral resolution as low as ~50 nanometres.

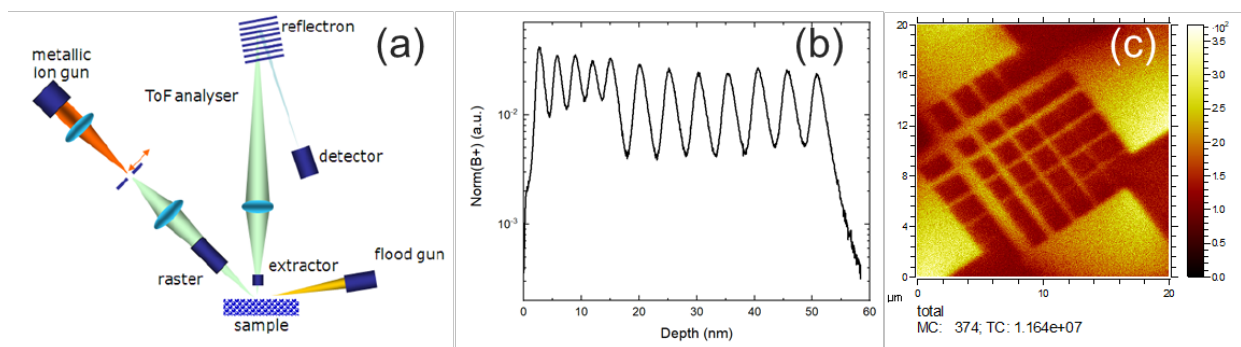


Figure 1: (a) ToF-SIMS principle, (b) Boron depth-profile from a reference sample, (c) ionic cartography on a nanowires mesh

In this practical session, we will go through the basic theory of ToF-SIMS (½ day) then illustrate with measuring on a couple of relevant cases (½ day).

Profile: scientists interested in characterisation techniques, mass spectroscopy, depth-profiling and chemical mapping. Recommended studies level: Master degree in Material's Science, Chemistry, Physics...