

A novel approach to a non-destructive depth profiling using soft x-ray spectroscopies

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While the chemical and structural analysis of a surface has become commonplace using a variety of techniques including Auger Electron Spectroscopy (AES) and x-ray photoemission spectroscopy, it is often advantageous to differentiate between the chemistry and structure of the surface and the near surface (e.g., interface). The method used to make this distinction depends on the thickness of the layers to be differentiated. If the combined thickness of the layers is greater than 100 Å, then the surface must be physically removed by ion bombardment before the subsurface components can be identified. However, the bombardment will consequently alter the structure and in many cases, particularly in soft matters, the surface structure and chemistry of the studied component [1]. This alteration makes these methods incapable of precise investigation of super sensitive structure such as the passivation superficial layers formed on the metal alloy oxides in contact with the electrolyte salts [2-3] and the interface formation between low dimensional superconductive layers and the substrate significantly, modifying their properties [4-5].

Here, we carry a novel approach to a non-destructive depth profiling using a combination of the soft x-ray absorption spectroscopy in total electron yield and total fluorescence yield mode with soft x-ray reflectivity measurement. This method allows to have a precise elemental and spatial map of the different layers based on the effective mean probing depth present in specific layers and allows an in depth studies of the super sensitive structures.

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