NON-DESTRUCTIVE CHEMICAL SPECIATION OF BURIED INTERFACES BY ABSORPTION SPECTROSCOPY AT GRAZING INCIDENCE CONDITIONS

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The occurrence of an interface between two different layers may lead to modified properties of the systems. For that reason, it is necessary to further develop characterization methodologies for probing the chemical speciation of interfaces, which can be crucial for various semiconductor applications.
A promising tool to analyse interfaces is the photon in – photon out technique of quantitative Grazing Incidence X-Ray Fluorescence (GIXRF) in combination with Near Edge X-ray Absorption Fine Structure (NEXAFS) spectrometry allowing for depth-profiling of thin layer stacks with respect to both the elemental composition and speciation [1,2]. The GIXRF regime is characterized by the occurrence of the X-ray Standing Wave (XSW) field offering a tuneable penetration depth of the incident radiation ranging from a few to several hundreds of nanometers. The investigated sample systems consist of buried boron carbide nanolayers varying in thickness deposited on 10 nm titanium and capped with 2.5 nm silicon dioxide. All layered structures are deposited on silicon-wafers.
The measurements were carried out at the plane-grating monochromator (PGM) beamline in the PTB laboratory at BESSY II using monochromatized undulator radiation and calibrated instrumentation [3,4]. Well characterized radiation in the soft x-ray range was employed for the analysis of the fine structure of the absorption edges of the light elements of interest. An important issue is the chemical binding state of the boron carbide metal interfaces. Initial results will be presented and compared to complementary XPS studies.

References:
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