Structural Characterization of Liquids at Interfaces

Reichert H.

Max-Planck-Institut für Metallforschung, Heisenbergstrasse 3, D-70569 Stuttgart, Germany
email: reichert@mf.mpg.de

Surfaces and interfaces are of fundamental interest in condensed matter physics and the availability of highly brilliant synchrotron radiation has boosted our understanding of the structure of surfaces and interfaces in the last decades, especially in the case of liquid materials. Nevertheless, the characterization of the structure of liquid and amorphous materials, which is already elusive in bulk system, still presents a challenge to experimental physics.
Most commonly, the structure of surfaces and interfaces is studied in surface scattering geometries (Grazing Angle Diffraction (GAD), Crystal Truncation Rod Diffraction (CTRD), and in specular and off-specular reflection geometry) at typical photon energies around 12keV. These techniques are not applicable in the case of deeply buried interfaces. Conventional x-ray scattering geometries are often unable to separate the scattering signals from structurally modified thin layers at an interface from the large background of bulk-like scattering signals. Especially for deeply buried interfaces, the strong absorption of the incoming and scattered photons within the capping material producing very weak scattering signals on top of a large background from the penetrated solid. We have recently developed a new transmission-reflection using high energy microbeams in a high resolution setup which allows us to resolve most of these problems [1]. Examples of interfacial structures at deeply buried interfaces will be presented for a variety of materials like metals, water and organic liquids. The examples demonstrate the applicability of our methods for the nondestructive and in-situ characterization of a broad range of interfacial liquid or amorphous structures.

References

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