Surface X-ray diffraction

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This is a general introduction to surface X-Ray Diffraction focusing the attention on the application to the study of the atomic geometry of surfaces and interfaces. The potentiality of the X-Ray experiments are compared with other structural experimental techniques. In the first part we summarize the basic principles of X-Ray diffraction in total reflection condition. In particular will be discussed the optical properties of the matter at X-ray frequencies and the peculiarities, from a diffraction point of view, of semi-infinite crystal with respect to an infinite one. In this context will be also discussed different kinds of rearrangement of surface atoms as a consequence of the broken symmetry along the direction perpendicular to the surface itself. The second part is dedicated to a selected set of applications to relaxed and reconstructed surfaces and low dimensional systems. The proposed examples range from clean semiconductor (GaAs(110)) and metal (Au(110)) surfaces to metal-seconductor (Bi/GaAs(110)), metal-metal (Fe/Cu_3Au(100)) and organic molecule-metal (CuPc/Au(110)) interfaces.