# Evaluation of The Interface Morphology of Mo/Si and W/Si Multilayers by X-Ray Specular Reflectivity and Diffuse Scattering

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Multilayer mirror is extensively used as x-ray optics for soft and ultraviolet region. [1) Recently, the *d*-spacing of superlattices can be change both in the lateral and normal directions, so that the multilayer optic is more frequently used as hard x-ray devices.[2)] The inter-diffusion and interface roughness of the surperlattice are keys in the performance of mirrors. Specular x-ray reflectivity and nonspecular diffuse x-ray scattering have been made to study such interface morphology. The experimental curves are measured for several Mo/Si and W/Si multilayers using Rigaku ATX diffractometer. The theoretical analysis of the diffuse x-ray scattering is based on the distorted-wave Born approximation.[3)] The modeling of interface structure during the simulations was carried out with respect to different replication modes and vertical correlation functions of the interfacial roughness as well as taking account of the lateral correlation of the jaggedness. Comparing the experimental curves with theoretical simulation, it was found that the transition layers Mo-on-Si and Si-on-Mo at the position of interfaces differ in the density, thickness and roughness for samples with different substrate materials. Furthermore, the interfaces between superlattice layers were found to be graded and possess the certain roughness replicated across the multilayer stack.

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