

## Multi-parameter Characterization of sub-nanometer Cr/Sc Multilayers based on Complementary Measurements

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### Abstract

Cr/Sc multilayer systems can be used as near-normal incidence mirrors for the water window spectral range. We show that a detailed characterization of these multilayer systems with 400 bilayers of Cr and Sc each with individual layer thicknesses below  $< 1$  nm is attainable by the combination of several analytic techniques. We used EUV- and X-ray reflectance measurements, resonant EUV reflectance across the Sc L-edge as well as X-ray standing wave fluorescence measurements. The parameters of our multilayer model were determined based on a particle swarm optimizer and validated using a Markov-chain Monte Carlo maximum likelihood approach. For the determination of the interface roughness diffuse scattering measurements were conducted.