

Yesterday's Multilayers – Tomorrow's Optics

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The ESRF Multilayer Laboratory looks back on a long-established operation. During the last 10 years more than half of all ESRF beamlines were equipped with multilayer based X-ray optics which corresponds to nearly 100 individual coating projects. This tradition suggests a study of the long-term stability of the involved multilayers.

Recently, several multilayers fabricated during the last decade were characterized again. The study covers various layer materials, for example [W/B₄C], [Ru/B₄C] and [Ir/Al₂O₃]. It differentiates between pure aging effects on witness samples and alteration of multilayers that were exposed to the synchrotron beam. The coatings are characterized with a conventional X-ray reflectometer. Computational algorithms are used to retrieve any changes in the optical or the structural properties.

The degradation mechanisms are a critical issue if the multilayers are used as monochromators in the white beam. Future experiments intend to measure this radiation impact in-situ. A first effort is made with the construction of a cryogenic test bench, which allows to observe possible changes of the reflectivity and modifications of the mirror figure during or after white beam exposure.

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