

Topical Seminar Rijnhuizen
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Aspects of SiFeCo multilayers used for neutron optics

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Maximal interface layer thickness and rough layers lead to the reduction of polarisation and reflectivity in the supermirror region. Another main obstacles in supermirrors with high critical angle is the stress which develops during the growth. The objective was to find the sputter parameters which lead to zero stress in the Si and Fe₈₉Co₁₁ layers.

The layers were sputtered on Si substrates and glass in a triode sputter machine. The bending radii of the samples were measured on a talystep machine and the stress was calculated with the Stoney formula. The multilayers on glass were investigated by X-ray reflection and polarized neutron reflection.

It is shown that increasing layer thickness leads to tensile stress for the Si layers and to compressive stress for FeCo layers. Thus the stress in the FeCo layers can be compensated by the one of the Si layers for a certain thickness ratio.

For argon pressure and substrate bias holder voltage values could be found which lead to zero stress. E. g. bias values of 30- 40 V lead to zero stress for monochromators and supermirrors.