Contribution ID: **487** Type: **Poster**

Interface engineering of 11B4C-containing Ni/Ti multilayer optics

Monday, 20 March 2023 16:00 (2 hours)

Ni/Ti is the material system of choice for non-polarizing reflective multilayer neutron optics such as monochromators, wave guides, and focusing devices. The reflected intensity as well as neutron energy range from state-of-the-art multilayers are hampered by an interface width limiting the optical contrast. Our previous work has shown that incorporation of low-neutron-absorbing 11B4C gives significant improvement in reflectivity, as a result of reduced interfaces widths, although at the expense of a lower optical contrast between the layers.

In this work we have designed multilayers to maximize the optical contrast between individual layers and minimize the interface width by incorporating 11B4C at different positions in the multilayer stack. By co-depositing 11B4C in the Ni layer only, an excellent optical contrast is achieved while inhibiting the formation of crystallites in the Ni layer as well as intermetallics between both layers. Another design involves the addition of ultra-thin 2 Å 11B4C layers between the Ni and Ti layers, reducing the interface width by inhibiting the formation of intermetallics at interfaces. Since the reflectivity performance depends exponentially on the ratio of interface width to multilayer period depth-dependent designs are needed. We demonstrate how a depth-graded supermirror requires a compound design where thicker layers are grown with pure Ni/Ti and thinner layers incorporate 11B4C.

Primary author: BROEKHUIJSEN, Sjoerd (Linköping University)

Co-authors: ERIKSSON, Fredrik (Linköping University); BIRCH, Jens (Linköping University); GHAFOOR, Naureen (Linköping University)

Presenter: BROEKHUIJSEN, Sjoerd (Linköping University)

Session Classification: Poster Session MONDAY

Track Classification: Neutron Instrumentation, Optics, Sample Environment, Detectors, and Software