Contribution ID: **30** Type: **Poster**

Coating the Inside of Neutron Spin Filters as an Alternative to using GE180

As alternative to solid state neutron super-mirrors, 3He neutron spin filters (NSF) constitute a widely used method for either polarizing an unpolarized neutron beam or for analyzing its polarization after scattering on the sample. The working principle of NSFs is based on spin-polarized 3He having a very large spin-dependent absorption cross-section, filtering out one neutron spin direction and letting the other pass when a neutron beam penetrates a spin-polarized NSF.

NSFs are typically application-optimized mouth-blown glass-cells of different shapes and sizes, which, – depending on the optical pumping process used to polarize the 3He – are either filled with 3He gas (for metastable optical pumping (MEOP)) or with additionally added Nitrogen and alkali metals (Rb and K) to allow for spin-exchange optical pumping (SEOP).

The ideal glass for making (in particular SEOP) NSFs is GE180 aluminosilicate, which in the past was widely used for halogen cycle lamps. However, with the technical evolution of lamps and illuminants, this kind of glass has been faded out of commercial production, such that NSF-production today relies on the world-wide remaining stock of GE180, which is also gradually used up.

This causes a GE-180 supply crisis and a search for a new type of equally suitable type of glass is at a high priority.

In this contribution, an alternative path to finding a new glass is presented, which can equally well solve the GE180 crisis:
Since the interaction of polarized 3He gas inside a NFS with the glass that the NSF is made from, occurs via the surface of the glass, both a coating technique for coating NSFs on their inside and a specialized coating is developed that allows the interaction of the polarized 3He with the glass to be controlled. In this way, the underlying glass that is used to produce the NSF can in principle be any commercially available glass.

An application specific coating setup will be presented, which allows glass cylinders to be coated on their inside by sputter deposition. As these glass cylinders need to be closed off on either side to form a closed NSF that can be filled with gas and alkali metals as required, additionally the setup and process for fusing Silicon windows to glass without any other materials added will be shown.

Please select the related topic from the list below

Instrumentation and methods

Primary author: KREUZPAINTNER, Wolfgang (China Spallation Neutron Source)

Presenter: KREUZPAINTNER, Wolfgang (China Spallation Neutron Source)

Session Classification: Poster session