

Cod moderator options for a Hi-CANS

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Abstract

The High Brilliance Neutron Source (HBS) will be a High-Current Accelerator-driven Neutron Source (Hi-CANS), using a maximum proton beam current of 100 mA and an energy of 70 MeV to produce neutrons mainly via (p,n) reactions. To use those neutrons for condensed matter research, especially in the nano-scale region, they have to be slowed down from several MeV to a few meV using cold neutron moderators.

In the HBS project, several materials that are commonly used as cold neutron moderators (hydrogen, methane, mesitylene) have been tested both by nuclear simulations and experimentally, using compact geometries to enhance cold neutron brilliance. Apart from their moderating efficiency, other issues have to be considered when using some of these materials inside a Hi-CANS compared to a low-current source, e. g. radiation damage and poor thermal conductivity.

One of the unique features of the HBS is that multiple target-moderator-reflector (TMR) units are provided, which can contain different thermal and cold moderators, each feeding different instruments. To allow an operation of cold moderators close to the neutron target inside a Hi-CANS TMR, a so-called *moderator plug* is used. It consists of a vacuum-insulated cryostat with a detachable fluid transfer and cold moderator section, a neutron guide and surrounding radiation shielding from lead and borated polyethylene. A prototype of the cryostat part was designed and manufactured at Forschungszentrum Jülich and was recently operated successfully in an experiment at the *JULIC* cyclotron.

Fig.1: Experimental setup for measurements with solid methane using the moderator plug prototype

