TECHNISCHE UNIVERSITÄT DRESDEN

[C1Po2A]

Current status of a cryostat for the provision of hydrogen with adjustable ortho-para-ratio for neutron moderation

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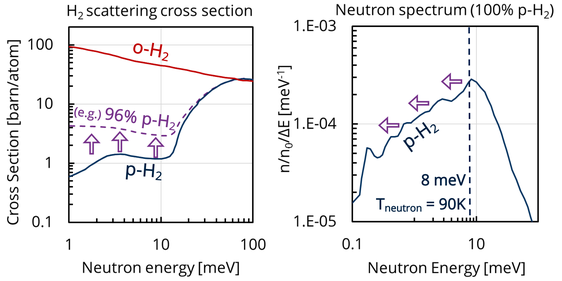
Motivation

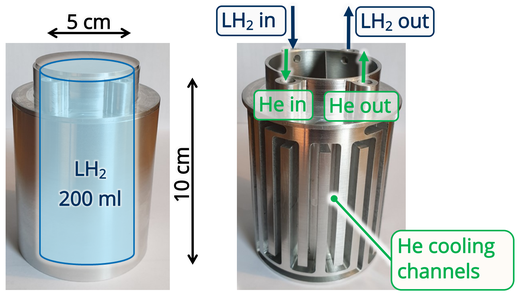
The Problem Cryogenic moderators using para-H_2 are currently widely used to produce cold neutrons. However, the neutrons cannot reach full *thermalization*, i.e. the neutron temperature lies above the temperature of the moderating medium. This is caused by the extremely low scattering cross section of para-H_2 for neutron energies below 30 meV.

The Idea Adding a well-defined amount of ortho-H_2 can increase the scattering cross section of the liquid hydrogen moderator and help moving the neutron spectrum towards lower energies, and hence reducing the neutron temperature.

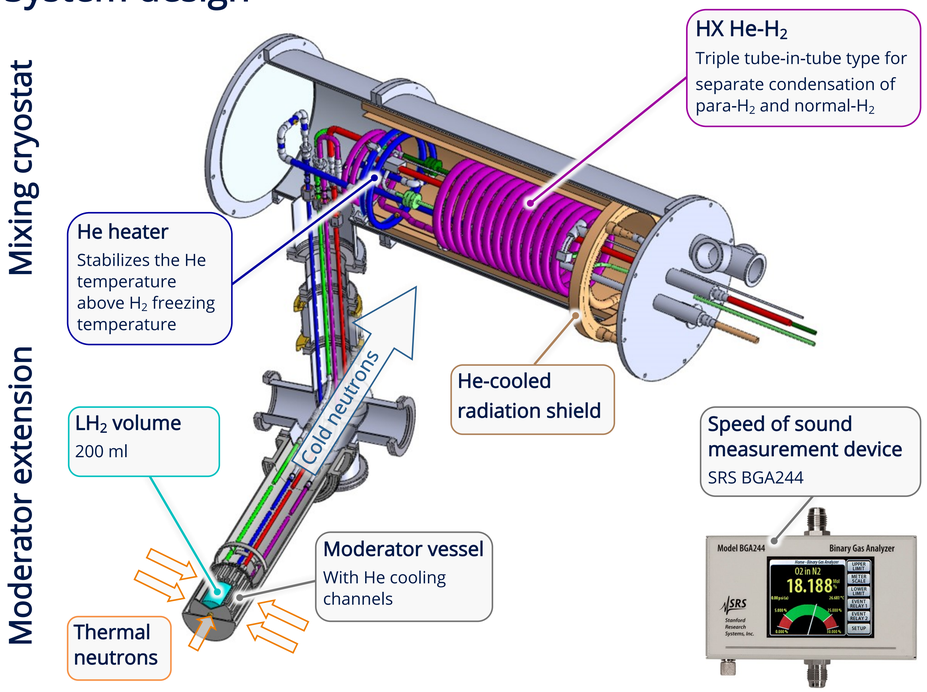
The Vision Building a cold moderator of unprecedented performance for the High Brilliance Neutron Source (HBS) currently being developed by Forschungszentrum Jülich in Germany

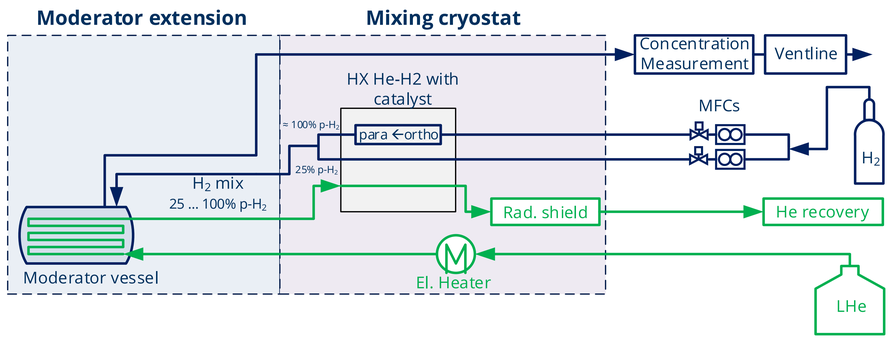


LH_2 moderator prototype



System design

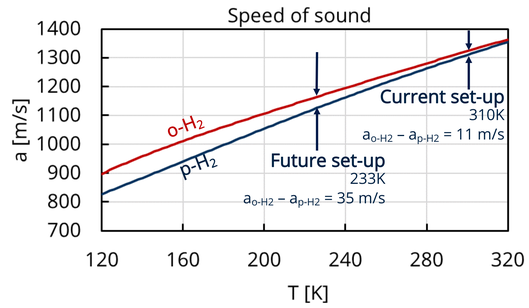




Concentration monitoring

Method Based on speed of sound (SRS BGA244)

Accuracy Currently being assessed and improved



Current status

- ✓ Commissioning of mixing cryostat successful
- ✓ Full conversion in ortho-para-H_2 catalyst shown
- ✓ Mixing operation for several ortho-para-H_2 ratios and concentration monitoring demonstrated
- ✗ Commissioning with moderator vessel to be done

Summary

A small-scale hydrogen liquefier with an adjustable ortho-para-H_2 ratio has been built and commissioned. As soon as a safe operation with the moderator vessel has been demonstrated, the system is ready for operation at a neutron source, e.g. the training reactor AKR-2 at TU Dresden, for measurements of neutron spectra resulting from different hydrogen compositions. This will be a crucial step towards the development of highly optimized cryogenic hydrogen moderators for use in Compact Accelerator-Driven Neutron Sources, such as the future High Brilliance Neutron Source in Jülich, Germany.

DRESDEN concept

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