

R&D on 2nd moderator fabrication for JSNS

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Abstract

1 MW short pulsed spallation neutron source (JSNS) is one of the main experimental facilities in J-PARC (Japan Proton Accelerator Research Complex). Hydrogen moderators (20 K, 1.5 MPa) were adopted to provide appropriate neutron pulses to the neutron scattering instruments. Due to the neutron irradiation damage of aluminum alloy A6061-T6, which is the structural material of the moderator vessels, the moderators should be replaced in every 6 yrs in the design under 1MW operation. A plan of 2nd moderator fabrication is under way. In the first design, aluminum alloy (A6061-T6) and 316 L stainless steel were adopted to make the moderator vessels and H₂ transfer lines as a material combination. The moderator vessel with H₂ transfer line is shrunken in the cool down to 20K, resulting in ca. 20 mm of thermal shrinkage in axial direction at maximum. The sixfold moderator pipings needed to be decentered between the ambient and cryogenic temperature regions to absorb the thermal shrinkage. Asymmetrical setting especially, at bending section, was adopted to make the H₂ transfer line to absorb thermal shrinkage. This made the moderator fabrication difficult, especially the at bending sections. It sometimes got into trouble, such as leak, welding deformation, etc., in the moderator fabrication process, resulting in extended fabrication period and cost increase. We are modifying the design, such as use of invar, reduction of vacuum layer in the H₂ transfer line and introduction of manifold structure, to make the 2nd moderator fabrication easier. In this paper, we report current status of the modification and R&D of the 2nd moderator design.