
SESSION 8: Magnetic Refrigeration

Paper 8.3 Wednesday POSTER Session 1:15 to 2:45 PM

Development of Hydrogen Condensation Heat Exchanger in Active Magnetic Regenerative Refrigerator (AMR)

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We have developed a magnetic refrigerator for hydrogen liquefaction that utilizes a phenomenon called the magnetocaloric effect, in which a temperature change occurs when a magnetic field is applied to a magnetic material. A method called active magnetic refrigeration (AMR) is used, in which a magnetic material is driven in and out of a magnetic field created by a superconducting coil. Compared to other methods of magnetic refrigeration system, AMR can produce a larger temperature difference due to the magnetocaloric and regenerative effect of the magnetic material. In this AMR-based hydrogen liquefaction, helium gas is cooled by the magnetocaloric effect, and hydrogen gas is liquefied by exchanging the heat with the cooled helium gas in a hydrogen condensation heat exchanger (HC-HEX). In this study, what kind of heat exchanger is most suitable for our AMR was researched to improve the liquefaction performance of AMR. Calculated thermal properties of different shaped HC-HEX were compared. Based on the comparison, HC-HEXes which were expected to have high performance, were fabricated. The results of the measurements of the thermal characteristics of HC-HEXes are reported.