

Development of Advanced Hydrogen Liquefaction System by Using Magnetic Refrigeration Technology

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For the supply chain of hydrogen, liquefaction cost may occupy 1/3 of the total supply price, therefore, developing a high efficient hydrogen liquefier is one of the most important technology issues for the hydrogen society. Magnetic refrigeration using the magnetocaloric effect has the potential to realize liquefaction efficiency higher than 50%, and also to be environmentally friendly and cost effective. A hybrid refrigeration cycle consisting of a precooling cycle and a magnetic active regenerator cycle has been proposed and estimated to achieve a liquefaction capacity of ~100 kg/day with liquefaction efficiency of ~50%. Our project is committed to develop 1) such a high efficient hydrogen liquefier and also, 2) a compact and energy saving re-condensation refrigerator to realize zero boil-off in the liquid hydrogen storage. This presentation will show the overview of the project and current status. This project has been funded by the JST-MIRAI Large-scale Project, Ministry of Education, Culture, Sports, Science and Technology of Japan.