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Development of a 2-stage metal hydride hydrogen compressor

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Abstract

As industry transitions to net zero, H2 is gaining interest as a potential energy carrier. There are, however, challenges replacing existing technologies and infrastructure with H2 based alternatives. An example is provided in the report produced by the National Renewable Energy Agency (USA) which showed that approximately 2/3 of the cost of delivering H2 at refuelling stations was due to the cost of compression. Metal hydrides are metals or intermetallic compounds that react reversibly with H2. They will absorb low pressure H2 at low temperature, and discharge at a high pressure when their temperature is raised, achieving compression. Metal hydride-based compressors use heat to achieve compression rather than electricity, and have the advantages of no moving parts, no noise, and reduced maintenance costs. Challenges include optimising heat transfer in the reactors, and optimal selection of suitable alloys for each stage of the compression for a given application.

CSIRO, in collaboration with Griffith University, are developing a 2-stage metal-hydride based H2 compressor. The aim is to compress H2 from 10 to 350 bar using heat < 150oC. Theory on alloy selection developed at Griffith University has been used to identify alloys for each stage of the compressor. Reactor and pressure vessel design has been progressed at CSIRO. This presentation will give an overview of the research project and recent progress in the design and commissioning of the prototype compressor.

The official language of the IERE General Meeting, Forum and Workshop is English. Each abstract must be submitted within 400 words in English.