Contribution ID: **105**

Type: **Poster**

C2Po1F-03: Development of a research cryostat for direct thermoacoustic cooling and conversion of hydrogen

Tuesday 11 July 2023 09:15 (1h 45m)

Hydrogen thermoacoustic instabilities are a relatively unexplored but promising opportunity for cryocooler development. This article describes a new research cryostat developed to investigate hydrogen as a working fluid in thermoacoustic systems. The cryostat is a modular, turbo-molecular pump driven, vacuum chamber with a 4.2 K pulse-tube cryocooler capable of 45 W of cooling at 50 K. To assess the performance of the cryostat, a feasibility study of direct thermoacoustic cooling with ortho-parahydrogen conversion is conducted. An acoustic resonator system is designed to excite acoustic modes via imposed temperature gradient on a porous stack between the ambient environment and cold strap connected to the cryocooler. The generated acoustic waves transfer heat inside of a porous regenerator insert to produce a refrigeration effect at cryogenic temperatures. In addition, the regenerator solid matrix will be catalyzed for ortho-parahydrogen conversion, demonstrating a novel combination of cooling and conversion of cryogenic hydrogen in a single device. Modelling results, design, construction, and performance of the cryostat are reported.

Authors: SHENTON, Matthew (Washington State University); LEACHMAN, Jacob (Washington State University); MATVEEV, Konstantin (Washington State University)

Presenter: SHENTON, Matthew (Washington State University)

Session Classification: C2Po1F: Miscellaneous I