Contribution ID: **376**

Type: **Poster**

C2Po3C-01: Thermodynamic and mechanical properties of solid-phase media for moving cryogenic energy storage packed beds

Tuesday 20 May 2025 14:00 (2 hours)

Solid-phase cold energy storage represents a scalable approach to thermal energy management, characterized by its suitability for deep low temperature applications, along with advantages related to safety, environmental sustainability, and cost-effectiveness. This technology finds extensive application in large-scale cryogenic systems, such as liquid air energy storage. The thermodynamic properties of solid-phase cold energy storage media play a crucial role in influencing both cold energy storage efficiency and overall system performance, furthermore, their mechanical properties are essential for ensuring operational stability. In this study, a total of five solid-phase media, including rock particles, glass beads, alumina, and brown corundum, were tested for cryogenic thermal conductivity. Based on the obtained thermophysical parameters, the thermodynamic performance of different cold energy storage media during the energy storage and release cycle was comparatively evaluated, employing heat penetration depth as an index. Numerical simulations of the cooling process of different solid-phase energy storage media were performed. In terms of mechanical properties, the mechanical strength of three preferred solid-phase cold energy storage media, namely, glass beads, alumina, and brown corundum, was experimentally investigated after high and low temperature cycling from 80 K to room temperature, and multiple free-fall motions at a certain height.

Author: Dr GAO, Zhaozhao (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

Co-authors: LI, Junxian (Key Laboratory of Cryogenic Science and Technology, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); LI, Yihong (Technical Institute of Physics and Chemistry, CAS); WANG, Zhikang (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); Dr CHEN, Liubiao (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences); Dr JI, Wei (Zhonglv Zhongke Energy Storage Technology Co.); WANG, Junjie (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

Presenter: Dr GAO, Zhaozhao (Technical Institute of Physics and Chemistry, Chinese Academy of Sciences)

Session Classification: C2Po3C - New Devices, Novel Concepts, and Miscellaneous I