

Screening of REM_2 (RE = Gd, Dy, Ho; M = Al, Ni) Laves phases for low temperature liquefaction applications

A. Musiał,¹ M. Oboz,² W. Janiszewska,¹ and Z. Śniadecki¹

¹*Institute of Molecular Physics, Polish Academy of Sciences,
M. Smoluchowskiego 17, 60-179 Poznań, Poland*

²*Institute of Physics, University of Silesia,
75 Pułku Piechoty, 41-500 Chorzów, Poland*

Magnetocaloric materials hold significant potential for the liquefaction of industrial gases, such as hydrogen, at cryogenic temperatures. In this study, we investigate a series of Laves-phase materials, focusing on their structural, magnetic and magnetocaloric properties. All synthesized compounds contain only or mostly, cubic $MgCu_2$ -type Laves phase. Obtained alloys are designed to serve as building blocks for composites and material stacks, with operating temperatures ranging from approximately 20 to 80 K. We examined the fundamental properties of selected REM_2 (RE = Gd, Dy, Ho; M = Al, Ni) Laves phases and their solid solutions to verify their suitability and determine optimal molar compositions. Although the implementation of this technology is currently limited by low thermal conductivity and inadequate mechanical properties. This initial analysis provides a foundation for developing more complex systems, such as alloy stacks or composites embedded in a thermally conductive matrix.