

Magnetocaloric effect in high-entropy dodecaborides

Leoš Ondriš,¹ Slavomír Gabáni,¹ Gabriel Pristáš,¹ Janina Zorych,^{1,2}
Oleksandr Onufrienko,¹ Natalya Shitsevalova,³ and Karol Flachbart¹

¹*Institute of Experimental Physics, Slovak Academy of Sciences,
Watsonova 47, SK-04001, Košice, Slovakia*

²*Department of Physics, Faculty of Electrical Engineering and Informatics,
Technical University of Košice, Park Komenského 2, SK-042 00, Košice, Slovakia*

³*Institute for Problems of Materials Science,
National Academy of Sciences of Ukraine,
Krzhyzhanovsky 3, UA-03680, Kiev, Ukraine*

High-entropy alloys represent a new class of metallic materials characterized by a combination of several (5 and more) chemical elements, resulting in high mixing entropy. New and very attractive group of these materials are high-entropy dodecaborides (HEAB₁₂), which allow the growth of relatively large single crystals with high-quality, enabling a more thorough investigation of their physical and mechanical properties. In this study, we investigated the magnetization, heat capacity and electrical resistivity of HEAB₁₂ with composition (Y_{1/8}Tb_{1/8}Dy_{1/8}Ho_{1/8}Er_{1/8}Tm_{1/8}Yb_{1/8}Lu_{1/8})B₁₂ at low-temperatures down to 2 K and in high magnetic fields up to 9 T, oriented along [100], [110], and [111] directions, respectively. Based on the magnetization and heat capacity measurements, the magnetocaloric effect (MCE) was analyzed, and the corresponding dependencies of the magnetic entropy ΔS_m and the adiabatic change of temperature ΔT_{ad} were evaluated. In addition, observed anomaly in electrical resistivity and heat capacity measurements at around 4 K is discussed.

This work was supported by projects APVV-23-0226 and VEGA 2/0034/24. Liquid nitrogen for experiments was sponsored by U.S. Steel Košice, s.r.o.