Investigation on the magnetocaloric effect in the rhombohedral ternary ordered variant of the cubic Laves phase of Pr_2Rh_3Ge

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The subject of this research is the ternary compound Pr_2Rh_3Ge obtained in the polycrystalline form, belonging to rhombohedral Laves phases (space group $R\overline{3}m$) [1]. The compound is known to be a ferromagnet with magnetic ordering temperature T_C = 8.5 K [2]. Nevertheless, the general picture of the physical properties of the ground state in this case seems to be quite intriguing, not to say intricate. The reason for this is the observed moderate heavy fermion behaviour of itinerant charge carriers at low temperatures (γ = 315 mJ/Pr-mol·K^2), with no sign of the spin Kondo effect [2]. In this situation, the mechanism responsible for mass enhancement leading to the heavy electron ground state is probably related with the dynamic low-lying crystal-field excitations. This assumption is based on the theory of excitonic mass enhancement proposed by White and Fulde [3] to explain the electron mass improvement in Pr ions and subsequently extended to rare-earth systems [4]. Driven by curiosity and a wish to expand the scope of existing knowledge about the physical properties of Pr_2Rh_3Ge, we present research on the magnetocaloric effect basis of the well-known thermodynamic approaches. The magnetocaloric properties were established in terms of the isothermal magnetic entropy change ΔS_M and the adiabatic temperature change ΔT_{ad} using the specific heat data and magnetization measurements.

References:

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