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MAGNETIC, MAGNETOCALORIC, THERMAL AND TRANSPORT PROPERTIES OF $\text{Gd}_3\text{Ni}_2\text{In}_4$

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The new polycrystalline intermetallic compound $\text{Gd}_3\text{Ni}_2\text{In}_4$ has been prepared. We have investigated the structural, magnetic, magnetocaloric, thermodynamic and transport properties. X-ray powder diffraction pattern displays that $\text{Gd}_3\text{Ni}_2\text{In}_4$ crystallizes in hexagonal $\text{Lu}_3\text{Co}_2\text{In}_4$ -type of crystal structure. The presence of two magnetic transitions, antiferromagnetic $T_N = 21\text{ K}$ and ferromagnetic T_C at 55.5 K was observed in magnetization studies. The maximal value of magnetic entropy change, $-\Delta S_M$, determined from isothermal magnetization data in a magnetic field of 9 T is 4.57 J/kg K , which is spread over a wide temperature range ($\Delta T = 61.5\text{ K}$) and hence it yields to a relative cooling power (RCP) of 281 J/kg . In addition, the compound shows a significant positive magnetoresistance, $\text{MR}(T = 2\text{ K}) = 44\%$ in magnetic field $B = 9\text{ T}$. Taking into account these results one could conclude that $\text{Gd}_3\text{Ni}_2\text{In}_4$ compound is exhibiting successive reversible magnetic transitions. Thus, it may comprise a distinct class of magnetocaloric materials as they work in a wider temperature range than conventional refrigerant materials.

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