

Accepted Manuscript

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PII: S1002-0721(18)30397-1

DOI: [10.1016/j.jre.2018.03.016](https://doi.org/10.1016/j.jre.2018.03.016)

Reference: JRE 191

To appear in: *Journal of Rare Earths*

Received Date: 30 November 2017

Revised Date: 16 March 2018

Accepted Date: 16 March 2018

Please cite this article as: Huo J, Du Y, Cheng G, Wu X, Ma L, Wang J, Xia Z, Rao G, Magnetic properties and large magnetocaloric effects of GdPd intermetallic compound, *Journal of Rare Earths* (2018), doi: 10.1016/j.jre.2018.03.016.

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Magnetic properties and large magnetocaloric effects of GdPd intermetallic compoundJianjun Huo ^a, Yusong Du ^{a,b,*}, Gang Cheng ^{a,b}, Xiaofei Wu ^{a,b}, Lei Ma ^{a,b}, Jiang Wang ^{a,b},Zhengcai Xia ^c, Guanghui Rao ^{a,b,*}

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Abstract

With the intention to explore excellent magnetocaloric materials, the intermetallic compound GdPd was synthesized by arc melting and heat treatment. The microstructure, magnetic and magnetocaloric properties of the intermetallic compound of GdPd were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and the physical property measurement system (PPMS). A large reversible magnetocaloric effect is observed in GdPd accompanied by a second order magnetic phase transition from paramagnetism to ferromagnetism at ~39 K. The paramagnetic Curie temperature (θ_p) and the effective magnetic moment (μ_{eff}) are determined to be 34.7 K and 8.12 μ_B/Gd , respectively. The maximum entropy change ($|\Delta S_{\text{Max}}|$) and the relative cooling power (RCP) under a field change of 5 T are estimated to be 20.14 J/(kg·K) and 433 J/kg, respectively. The giant reversible magnetocaloric effects (both the large ΔS_M and the high RCP) together with the absence of thermal and field hysteresis make the GdPd compound an attractive candidate for low-temperature magnetic refrigeration.

Key words: GdPd compound; Magnetocaloric effect; Magnetic entropy change; Magnetic refrigeration material; Rare earths

Foundation item: Project supported by the National Basic Research Program of China (2014CB643703), the National Key Research and Development Program of China (2016YFB0700901), and the National Nature Science Foundation of China (51261004, 51461012).

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