

Accepted Manuscript

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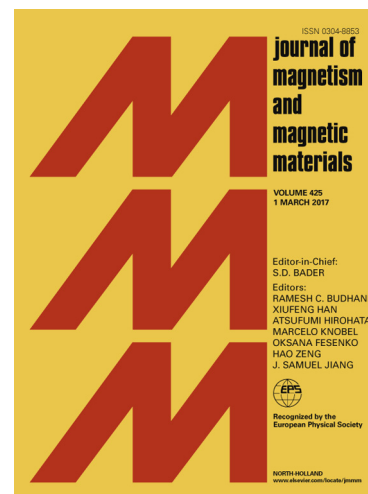
PII: S0304-8853(18)31659-7
DOI: <https://doi.org/10.1016/j.jmmm.2018.09.056>
Reference: MAGMA 64338

To appear in: *Journal of Magnetism and Magnetic Materials*

Received Date: 30 May 2018
Revised Date: 1 August 2018
Accepted Date: 15 September 2018

Please cite this article as: Y. Ma, X. Dong, Y. Qi, L. Li, Investigation of the magnetic and magnetocaloric properties in metamagnetic $REFe_2Si_2$ ($RE = \text{Pr}$ and Nd) compounds, *Journal of Magnetism and Magnetic Materials* (2018), doi: <https://doi.org/10.1016/j.jmmm.2018.09.056>

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Investigation of the magnetic and magnetocaloric properties in metamagnetic $REFe_2Si_2$ ($RE=Pr$ and Nd) compounds

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Abstract: The crystal structure, cryogenic magnetic and magnetocaloric properties in $NdFe_2Si_2$ and $PrFe_2Si_2$ compounds have been investigated. The $NdFe_2Si_2$ and $PrFe_2Si_2$ crystallized in the body-centered tetragonal structure with the space group of $I4/mmm$, and underwent first order magnetic transition from paramagnetic to antiferromagnetic (PM - AFM) around Néel temperatures T_N of 8.5 K and 15.5 K, respectively. Under an applied-field change of $\Delta H=5$ T, the maximum values of magnetic entropy change ($-\Delta S_M^{max}$) are 6.4 J/kg·K and 12.4 J/kg·K for $PrFe_2Si_2$ and $NdFe_2Si_2$, corresponding to relative cooling power (RCP) values of 0.8 J/cm³ and 1.0 J/cm³, respectively. Moreover, under low applied field change and at low temperatures, the $PrFe_2Si_2$ and $NdFe_2Si_2$ show an inverse MCE because of the existence of the AFM ordering, while under high external magnetic field change, a normal reversible MCE is observed, which is caused by first-order magnetic transition from antiferromagnetic (AFM) to ferromagnetic (FM) state.

Keyword: Rare earth based intermetallic compound; $NdFe_2Si_2$; $PrFe_2Si_2$; Magnetic property; Magnetocaloric effect.

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