

Accepted Manuscript

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PII: S0925-8388(14)02358-5
DOI: <http://dx.doi.org/10.1016/j.jallcom.2014.09.185>
Reference: JALCOM 32302

To appear in: *Journal of Alloys and Compounds*

Received Date: 28 April 2014
Revised Date: 2 September 2014
Accepted Date: 23 September 2014

Please cite this article as: A.V. Vershinin, V.V. Serikov, N.M. Kleinerman, V.S. Gaviko, N.V. Mushnikov, Magnetic phase transitions in $\text{La}(\text{Fe}_{0.88}\text{Si}_x\text{Al}_{0.12-x})_{13}$ ($x = 0.033$ and 0.096) compounds, *Journal of Alloys and Compounds* (2014), doi: <http://dx.doi.org/10.1016/j.jallcom.2014.09.185>

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Magnetic phase transitions in $\text{La}(\text{Fe}_{0.88}\text{Si}_x\text{Al}_{0.12-x})_{13}$ ($x = 0.033$ and 0.096) compounds

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*Institute of Metal Physics UB RAS, S. Kovalevckaya str. 18, 620990 Ekaterinburg, Russia***Abstract**

Magnetic properties, structure parameters, linear thermal expansion, and Mössbauer effect have been measured on intermetallic compounds $\text{La}(\text{Fe}_{0.88}\text{Si}_x\text{Al}_{0.12-x})_{13}$ ($x = 0.033$ and 0.096) with the ground ferromagnetic state. The compound with $x = 0.033$, on growing temperature, demonstrates a transition to antiferromagnetic state at $T_{\text{F-AF}} \sim 140$ K and then paramagnetic state at $T_{\text{N}} = 190$ K. The compound with $x = 0.096$ is a ferromagnet with $T_{\text{C}} = 190$ K, and the transition to paramagnetic state is of the first order. The ferromagnetic ordering is accompanied by the lattice expansion by 0.5% and 1.2% for compositions with $x = 0.033$ and 0.096 , respectively. It is established, based on the results of fitting of Mössbauer spectra, that the antiferromagnetic state is predominantly featured by the subspectrum with a positive quadrupole shift, whereas in the ferromagnetic state approximately equal contributions with the quadrupole shifts of different signs are observed.

Keywords: Rare-earth intermetallics; Magnetic phase transition; Hyperfine interactions; Magnetic ordering; Crystal structure.

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