

Thermodynamic and transport properties of $\text{CeCo}_{0.75}\text{Si}_{2.25}$

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Aimed at synthesizing a ternary compound CeCoSi_3 , a well-developed single crystal of the nonstoichiometric phase $\text{CeCo}_{0.75}\text{Si}_{2.25}$ was grown by Czochralski pulling method. Metallographic microstructure analysis by optical microscopy and electron microprobe analysis by wavelength-dispersive X-ray spectroscopy indicated homogeneous material, free of any impurity phases. Single crystal X-ray diffraction yielded an orthorhombic CeNiSi_2 -type structure being a unit cell of $\text{CeCo}_{0.75}\text{Si}_{2.25}$, yet also provided hints at formation of so-far unsolved superstructure due to partial ordering of Co/Si atoms. The chemical composition derived from the X-ray data corroborated that obtained from the spectroscopic studies. Magnetic susceptibility measurements revealed a predominant mixed valence character of the Ce ions. Surprisingly, the compound was found to order magnetically at low temperatures, and this behavior was confirmed by the heat capacity and electrical resistivity data. The observed features may be related to complex crystal structure with a few inequivalent Ce sites characterized by both fluctuating and stable configurations of the electronic $4f$ shell.

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