

Magnetic properties of bulk $\text{Nd}_{50}\text{Co}_{10}\text{Fe}_{30}\text{Al}_{10-x}\text{V}_x$ alloys

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Abstract: This paper presents the results of study on the structure and the properties of the bulk $\text{Nd}_{50}\text{Co}_{10}\text{Fe}_{30}\text{Al}_{10-x}\text{V}_x$ ($x = 0, 2, 4, 6, 8, 10$) alloys prepared by arc-melting and suction casting with water cooling. The cast surfaces of the samples are partly crystalline and the amorphous volume fraction increases with distance into cast samples. With increasing V content, the crystallization volume fraction increases and for $x = 10$, the alloy is fully crystallized. In general, the melting temperature increases, but M_s and H_c decrease with V content. The Curie temperature increases clearly from 430 K ($x = 0$) to 512 K ($x = 10$). Thermomagnetic measurements of all samples done in low fields indicate the existence of the Hopkinson effect, which shows a coherent rotation magnetization and a strong reduction of the magnetic anisotropy in partly crystallized samples. The field-cooled (FC) and the zero-field-cooled (ZFC) curves measured in low fields reveal an obvious separation from each other at low temperatures, pointing to the existence of a cluster-glass state. The cluster-glass fraction decreases with increasing V content in the samples.

Author Keywords: Cluster-glass state; Hopkinson effect; Rare-earth alloys

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