

Investigation of the nanocrystallization process and the magnetic properties of finemet-like $\text{Fe}_{73.5}\text{Si}_{17.5}\text{B}_5\text{Nb}_3\text{Cu}_1$ ribbons

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Abstract: The crystallization evolution and the soft magnetic properties of a a Finemet-like nanocomposite ribbon, $\text{Fe}_{73.5}\text{Si}_{17.5}\text{B}_5\text{Nb}_3\text{Cu}_1$, have been investigated by using differential scanning calorimetry (DSC) and thermomagnetic measurements. The results show that DSC curve exhibits two clearly exothermal peaks, one at 535 °C and the other at 670 °C, which are related to crystallization of the α -Fe(Si) and the boride phases, respectively. The crystallization activation energy is evaluated by using two models, the Kissinger model and the Johnson-Mehl-Avrami (JMA) model, which are consistent with each other. Ultrasoft magnetic properties are obtained after proper annealing due to the formation of an appropriate volume fraction of nanostructured α -Fe(Si) embedded in a residual amorphous matrix to compensate the total magnetostriction. The influence of the annealing process on the soft magnetic properties of the studied sample was investigated and is discussed.

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