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Correlation between local structure and magnetic behavior in co-sputtered $Tb_xFe_{73}Ga_{27-x}$ ($7 \leq x \leq 11$) thin films

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We report on the evolution of the microstructure of Tb-Fe-Ga films deposited by co-sputtering from $Tb_{33}Fe_{67}$ and $Fe_{72}Ga_{28}$ targets. The sputtering power was fixed (90 W) in the $Fe_{72}Ga_{28}$ whereas it was increased from 50 to 90 W in the $Tb_{33}Fe_{67}$ target resulting on $Tb_xFe_{73}Ga_{27-x}$ layers with $7 \leq x \leq 11$. The local structure was determined by means of x-ray absorption fine structure spectroscopy at Fe-K, Ga-K and Tb-L_3 edges. The increase of Tb in the alloy promotes the phase segregation that produces a larger amount of the $TbFe_2$ structural phase. The structural results have been correlated with the magnetic characterization that shows the enhancement of the out-of-plane component of the magnetization.

Keywords: sputtering; iron alloys; x-ray absorption fine structure; magnetic properties

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