Optimisation of the thermoelectric properties of Fe_2VAl thin films obtained by co-sputtering

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The Fe_2VAl Heusler compound is attracting increasing interest from the scientific community due to its excellent performance in terms of power factor [1-2] around room temperature, coupled with the high availability and non-toxicity of its constitutive elements. Thermoelectric thin films are of interest from a fundamental point of view, especially owing to the possibilities of nano-structuring, but also from an application point of view where it could facilitate the integration of thermoelectric modules for powering low power electronic devices such as autonomous sensors. Nevertheless, studies on Fe_2VAl thin films are relatively scarce and some recent results still raise some questions [3-4].

In this study, Fe_2VAl thin films were processed by a co-sputtering method allowing to easily control the stoichiometry of the films. After process optimisation, p- and n-type layers have been obtained with power factors of 0.8 and 1.6 $10^{-3}W/mK^2$, respectively. In addition, we determined using advanced microstructure analysis that the increase of thermoelectric performances is related to crystal ordering during annealing.

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