

Open die pressing of thermoelectric materials: a solution for material sintering and texture inducing

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Abstract

Many conventional thermoelectric materials are anisotropic: the structural complexity, useful to improve the material efficiency, often leads to a strong dependence of the material properties on the different spatial direction considered. This aspect, lately subject of increasing interest, has been often neglected in the study of polycrystalline samples, because of their randomly oriented grain structure. Recently, looking for further improvements in thermoelectric efficiency, techniques for the sintering of polycrystalline samples able to preserve the natural anisotropy of the compounds have been studied and developed. The common target is to produce bulk samples easier to deal with as respect to single crystals, with improved thermal and mechanical properties, preserving the optimal electrical characteristics. In some cases, the latter depending on the crystallographic direction considered.

The present work reports the results obtained for material fast sintering and texture inducing using open die pressing technique, focusing on the effects produced by the mechanical processing. The open die pressing results to be effective in the fast sintering of different classes of materials. The process is easily scalable and does not require special expensive facilities. It also induces a strong texturing effect in the polycrystalline bulks preserving the anisotropy of electrical properties (α and σ). Both structural analyses and microscopy display strong orientation of the material after sintering. Here, recent results obtained on sintering SnSe and tetrahedrites powders are reported.