Synthesis, characterization and densification of n- and p-types skutterudites belonging to the $Sm_y (Fe_{1-x} Ni_x)_4 Sb_{12}$ system to be used as substrates for wettability studies

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The thermoelectric performance of a material is related to its intrinsic electronic properties, but it can also be affected by the processing route it was subjected to. Especially, densification is expected to increase the electric conductivity of the material as a result of the enhancement of its compaction degree. The thermoelectric response of the filled skutterudite $Sm_y(Fe_xNi_{1-x})_4Sb_{12}$ to changes in the processing parameters was considered by determining its Seebeck coefficient and electric conductivity in the 300 - 500 K temperature range. Samples having both *p*- and *n*- character, were prepared by the conventional melting-sintering technique[1-2]; subsequently, they underwent a ball milling process in order to be successively densified by spark plasma sintering (SPS) at different pressures, in order to investigate the effect of the pressure variation on power factor. A growth in the electric conductivity occurs at each temperature with increasing the applied pressure, while the Seebeck coefficient points at a more complicated dependence on pressure. Consequently, a non-trivial behavior of power factor *vs*. applied pressure was detected. Results are discussed in association with density and microhardness measurements[3].
One step closer to the design of a thermoelectric device is the obtainability of reliable joining methods for the thermoelectric material. As a consequence, the chemical reactivity of $Sm_y(Fe_xNi_{1-x})_4Sb_{12}$ using Sn- and In-based alloys in wetting tests performed at 773 K for 20 min by the sessile drop method was investigated. Squared samples were obtained from aforementioned densified samples, and wettability tests were carried out. From SEM analyses, a fairly intricate situation was found, due to the coexistence and the interaction of a large number of different elements in each examined system. Indeed, In strongly reacts with the skutterudite forming InSb intermetallic; otherwise, Sn revealed a more auspicious behavior being its reactivity restricted while in association with an appropriate wettability.

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