Synthesis, characterization and densification of n- and p-types skutterudites belonging
to the Sm₃(FeₓNi₁₋ₓ)₄Sb₁₂ 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 Sm₃(FeₓNi₁₋ₓ)₄Sb₁₂ 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 technique¹²; 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 measurements³.

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 Sm₃(FeₓNi₁₋ₓ)₄Sb₁₂ 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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3) C. Artini, G. Latronico, R. Carlini, S. Saini, T. Takeuchi, S. Choi, A. Baldini, U. Anselmi-Tamburini, F.