On the chemical synthesis route to bulk-scale skutterudite materials - DTU Orbit (08/11/2017)

On the chemical synthesis route to bulk-scale skutterudite materials

In this article an alternative high yield route for the synthesis of CoSb3-based unfilled skutterudites is presented. Using low-melting temperature salts of the constituents, melting and mixing them homogeneously in a hydrophobic liquid with postprocessing of the powders we achieve a more intimately mixed alloy compared to the conventional melting and metallurgical processes. The proposed method consists of a fast and low-temperature processing step followed by a thermochemical post-processing step, compared to the conventional methods of fabricating skutterudites, which require high temperatures and long processing times. Several structural characterization techniques were used to assess the mechanism of synthesis, verify the purity of the material as well as the reproducibility of the process. Detailed analysis and results are presented in support of the proposed process. Additionally, compaction of the powders with SPS technique provided a safe route to maintaining the nanopowder size and achieving low thermal conductivity (3 W/mK). The proposed method can easily be scaled up and adopted by the industry.

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