

Priority Programme

“Material Synthesis near Room Temperature”



Project Description – Project Proposal

Low-temperature Synthesis of Thermoelectric Materials by Thermal Decomposition of Tailor-made Metal Organic Precursors in Ionic Liquids

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Summary of proposal

The project aims at developing synthetic routes to improved thermoelectric V₂VI₃ materials. This shall be accomplished by decomposition of tailor-made single-source-precursors as well as highly reactive dual source precursors in ionic liquids by microwave irradiation. Ionic liquids offer here the advantage that they allow for a clean synthesis under mild reaction conditions, e.g. low reaction temperatures, as they not only serve as the solvent but omit the employment of additives. Moreover, they act also as the structure directing agent and nanoparticle stabilizer. Yet after preparation, the surface of the particles can be easily cleaned from the IL, which is extremely important for the thermoelectric performance of the resulting material. In addition, they can be tailored with respect to their physico-chemical properties (e.g. viscosity influencing mass transport rates, solubility of the different precursors etc.) The full advantages of the complex synthesis using tailor-made precursors and IL can be seen in the thermoelectric transport properties of the compacted nanopowder, showing very competitive material's figure of merit. Therefore, the determination of the most important thermoelectric properties such as Seebeck coefficient, power factor as well as thermal and electrical conductivity is essential for the successful determination of the most suitable precursors, ILs and synthesis conditions.