

Priority Programme

“Material Synthesis near Room Temperature”



Project Description – Project Proposal

Low-Temperature Approach to Solvent-Free Chalcogenidometalate Materials

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Summary of proposal

Within this project, we aim at the optimization and development of sustainable, low-temperature approaches to crystalline chalcogenidometalates by ionothermal synthesis, and at the deep understanding of the corresponding processes. Our target compounds and respective synthetic strategies are: 1) ternary nano-structured, crystalline chalcogenidometalate materials that will be synthesized by uncommon precursor combinations, and 2) complex and heavy metal chalcogenidometalate materials that will be accessed by employment of ionic liquids as non-innocent reaction media. The target compounds have been carefully selected according to our experiences and according to new collaborations that were installed during the previous funding period. The compositions can be generalized by the following formula: $(\text{Cat})_q[(\text{Mt}, \text{c}, \text{a}, \text{hx})\text{TyEz}(\text{R})_j][\text{An}]_p$ (Cat = alkali metal, (element-)organic or complex cation; Mt = transition metal; Mc = pentel metal within complex cation: Sb, Bi; Ma = triel metal within complex anion: Ga, In; Mh = heavy metal: Cd, In, Sn, Sb, Hg, Pb, Bi; T = Ge, Sn; E = S, Se, Te; R = organic group; An = (pseudo-)halide or complex anion). By variation of the composition, we will address the products' specific opto-electronic and thermoelectric properties that are analysed by a diversity of experimental and computational methods by ourselves or in collaborations within the framework of SPP 1708.