Priority Programme

“Material Synthesis near Room Temperature”

Project Description – Project Proposal

Thermochemical investigations of phase formation processes of elements and compounds of group 15 and 16 in ionic liquid based synthesis - Mechanism of dissolution, structure formation and precipitation

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Summary of proposal

Within this project, significant contributions can be made for physico-chemical investigation of reactions in ionic liquids as well as for determination of thermal stability of syntheses mixtures and thermodynamic properties of products (low temperature materials). The methodical investigation of basic model systems and the development of new materials syntheses in systems containing elements of groups 15 and 16 is aspired. Thereby, the chemical focus is set on differentiation of element allotropes in low temperature synthesis, the directed synthesis of compounds of groups 15 and 16 with defined composition within the homogeneity range, and preparation of Bismuth-based layer compounds. Additionally, the formation of homoatomic and heteroatomic poly-cationic compounds with incorporation of IL flux components is aimed.

Studies on the mechanism of dissolution, phase formation, and precipitation can be realized using reaction calorimetry, spectroscopy, and dynamic scanning calorimetry (DSC). For comprehension of reaction pathways of syntheses above room temperature the thermal behavior and the reactivity of products of thermal decomposition of ionic liquids and their flux systems is to involve in our investigations.

The determination of thermodynamic standard data allows modeling using CalPhaD-methods and thus enables a comprehensive thermodynamic description of reaction pathways and phase relations of the respective chemical systems.