Priority Programme

"Material Synthesis near Room Temperature"

Project Description – Project Proposal

Functional Nanoparticles for Lighting Materials and Antibacterial Coatings

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Summary of proposal

In this project we aim for three main objectives: firstly Eu2+ containing nanoparticles which are very important for lighting functional materials can be produced with ionic liquids as starting materials with a much better quality and a smaller size as our preliminary works show. Compared to the melting method which is currently used for the production of these materials our new method save a lot of raw materials, energy and time. Furthermore, new nanosized luminescence materials can be prepared by this method which is not known yet. Another approach is the development of functional materials for antibacterial coatings. A third goal of this project is the investigation of extremely small Eu2+ doped particles which are suitable to answer the question if the luminescence properties of these ions can be changed with the particle size. This would in fact lead to a new strategy for the development of functional materials for many purposes. Ideal candidates for these studies are fluorides, oxides and sulfides, undoped or doped with divalent lanthanide (Ln2+) ions, due to their expanded bandgap, antiseptic or semiconductor character. Nevertheless, the currently available synthesis methods are not appropriated for the preparation of these lattices in a small nanoscale. Especially for Ln2+-doped crystals, the oxidative nature of water and other conventional solvents consist a major obstacle. The ultimate solution of this impasse is offered by ionic liquid (IL)-assisted synthesis methods. Because of the high polar and coordinative environment, ILs are able to easily solve reactants and stabilize the particle surface, avoiding undesired crystal growth. In contrast with water, ILs are able to stabilize lanthanide ions in the divalent state, enabling the direct precipitation of Ln2+ particles and avoiding post-synthetic reducing annealing steps at T > 1000°C and artificial atmosphere.