# Abstract

Europium (Eu)-activated barium halide nanocrystals in fluorozirconate based glass ceramics represent a promising class of x-ray scintillators. The scintillation in these glass ceramics is mainly caused by the emission of divalent Eu incorporated in hexagonal $BaCl_2$ nanocrystals which are formed in the glass matrix upon appropriate annealing. Experiments with cerium (Ce)-activated fluorozironate glass ceramics showed that Ce is an interesting alternative. In order to get a better understanding of the scintillation mechanism in Eu- or Ce-activated barium halide nanocrystals, an investigation of the processes in the corresponding bulk material is essential. The objective of this thesis is the investigation of undoped, Eu-, and Ce-doped barium halides by x-ray excited luminescence (XL), pulse height, and scintillation decay spectra. That will help to figure out which of these crystals has the most promising scintillation properties and would be the best nanoparticles for the glass ceramics. Furthermore, alternative dopants like samarium (Sm) and manganese (Mn) were also investigated.

Besides the above-mentioned optical investigation electron paramagnetic resonance (EPR) and Mössbauer measurements were carried out in order to complete the picture of Eu-doped barium halides. The EPR data of Eu-doped $BaI_2$ is anticipated to yield more information about the crystal field and crystal structure that will help to understand the charge carrier process during the scintillation process. The main focus of the Mössbauer investigations was set on the Eu-doped fluorochlorozirconate glass ceramics. The results of this investigation should help to improve the glass ceramics. The $Eu^{2+}/Eu^{3+}$ ratio in the glass ceramics should be determined and optimize favor of the $Eu^{2+}$. We also want to distinguish between $Eu^{2+}$ in the glass matrix and $Eu^{2+}$ in the nanocrystals. For a better understanding of Mössbauer spectroscopy on Eu also measurements on Eu in a $CaF_2$ host lattice were carried out.