Title: Fast scintillation materials based on tailored monocrystalline perovskites and garnets

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Abstract: This dissertation thesis is focused on the possibilities of speeding-up the main decay component of selected monocrystalline bulk scintillator via energy transfer toward the acceptor. In the beginning it summarizes the main scintillator characteristics together with their respective measurement methods, as well as several growth methods used for the preparation of the crystals for all the samples characterized further in this thesis. In particular, one chapter is focused on the detailed description of the scintillation decay measurement, because this particular method was much improved during the work on this thesis.

The main part is focused on the photoluminescent and scintillation characteristics of codoped YAG:Ce and LuAP:Ce bulk scintillators. For these compositions we theoretically described the energy transfers according to the Förster-Dexter model and calculated its microscopic parameters. Moreover for the (Lu,Gd)AP:Ce we characterized in detail all the scintillation parameters and show its high application potential for TOF-PET scanners and TOF-CT X-ray medical imaging.

Keywords: Energy transfer, codoping, multicomponent monocrystalline scintillators, band-gap engineering