The energy that is absorbed by nanoparticles could be released by photon emission (luminescence) or by emission of phonons, i.e. by generating heat. The analysis of interactions between light and nanoparticles, such as heating, heat dissipation and heat exchange with the environment is particularly important when they could be applied in photodynamic therapy or hyperthermia of tumors, photothermal induced drug release processes, solar energy production or mechanical actuators. Considering the fact that the efficiency of light-to-heat conversion depends on the absorbing material, there has been a growing interest in searching for novel solutions in this field. By analyzing doped nanomaterials, rare earth ions are selected for researches dealing with effective light-to-heat conversion. However, the limiting factor for nanoparticles doped with lanthanide ions is their relatively low absorption cross-section. For this reason, a new solution with application of Cr^{3+} ions as heat generators was proposed in this project. The main goal will be to investigate the influence of the selected matrix stoichiometry on the efficiency of light-to-heat conversion by Cr^{3+} ions with different concentrations. The presented approach involving transition metal ions as light-to-heat converters was dictated by the fact that they are characterized by larger absorption cross-section than in the case of lanthanide ions. Therefore, they can absorb more quantity of energy, which is then released in the form of heat as a result of non-radiative relaxation processes. This shows that heat generation by transition metal ions will be much more efficient than in the case of lanthanides. In addition, the borate matrix was chosen for the research due to the fact that it has the highest energy of phonons, which facilitates the processes with heat generation. The luminescence of Cr^{3+} ions is strongly dependent on the environment in the crystal structure of the matrix, thus appropriate modifications will affect its intensity and lead to its effective quenching, which is a desirable process in case of heat generation. The implementation of this project would provide basic research leading to gain the knowledge about the light-to-heat conversion process in materials doped with Cr^{3+} ions. In turn, this would form the basis for developing the potential of these materials for specific applications.