Transition metal ions doped nanocrystals arouse more and more research interest among the scientists around the world because of their unique spectroscopic properties which are strongly susceptible to the local crystallographic environment, in which they are located. Hence, it is possible to modify the luminescent parameters of the phosphors doped with these ions by appropriate modification of their chemical composition. Moreover, the luminescence of these ions is highly dependent on the temperature at which the measurement is performed. Combining these facts allows to design a luminescent thermometer which will be precisely matched to the spectral and temperature range that the potential application requires. One of the less investigated transition metal ions showing great potential is Ti^{3+}. Due to the high influence of the host material structure on its optical parameters and relatively long lifetime, it can find the potential application in temperature imaging in many fields of science and industry. Considering that to what extent the thermometric parameters of this type of luminescent thermometers depend on the material in which the Ti^{3+} ions are located, the intensive work is currently carried out to design a luminescent thermometer with high sensitivity to temperature changes. The aim of this project is to investigate the mechanism of thermal quenching of Ti^{3+} ions luminescence in $LnAlO_3$ perovskite structures in order to create a luminescence thermometer with extremely high sensitivity to temperature changes.