Pressure is a crucial parameter that significantly influences industrial processes. Controlling pressure is essential to ensure the smooth operation and safety of technological processes. Consequently, an increasing amount of research is being conducted to develop new pressure sensors that offer remote and precise readout, enabling real-time monitoring of parameter. One category of such pressure sensors is luminescence manometers, which accurately indicate pressure values in non-contact way. These sensors operate by detecting changes in the spectroscopic properties of a phosphor when subjected to applied pressure. One of the mechanisms behind these changes is the shortening of the metal-oxygen distance due to applied pressure, leading to an increase in the strength of the crystal field. Hence, phosphors that exhibit spectroscopic properties strongly influenced by the crystal field strength are extensively investigated for the development of luminescence pressure sensors highly sensitive to pressure changes. Among these phosphors are Ni^{2+} ions, which surprisingly have been subject to limited studies regarding their pressure-dependent spectroscopic properties. Considering the significant influence of crystal field strength on the luminescence of Ni^{2+} ions, they have the potential to serve as highly sensitive luminescent manometers.

The objective of this project is to develop the luminescence manometers based on the emission of Ni^{2+} ions in doped XGa_2O_4 (X is a divalent metal cation) and investigate their manometric properties, which are influenced by various factors, including the material parameters of host materials. Achieving this aim necessitates enhancing the emission intensity of Ni^{2+} ions, which is the primary reason why the spectroscopic properties of these ions in relation to applied pressure are rarely explored. Consequently, a thorough optimization of the syntheses and composition of materials doped with Ni^{2+} ions will be conducted.