The main scientific goal of the project is to expand our knowledge in the field of smart materials. This group of materials are designed in such a way to possess specific properties that can be significantly changed in a controlled fashion by external stimuli. The investigated group of materials will be made of metal alloys exhibiting the so-called magnetic shape memory effect. This effect is based on the twin boundaries motion induced by an external magnetic field that as a consequence results in a macroscopic shape change of the material. The Ni-Mn-Ga Heusler alloys belong to a groups of materials exhibiting the magnetic shape memory effect or magnetic-field induced strain (MFIS) effect. During past few decades a significant progress has been observed in recorded values of longitudinal strain induced by external magnetic field. However, there are still some issues and challenges to be resolved such as the improvement of mechanical properties, reduction of twinning stress, as well as an increase of the operating temperature range. However, the MFIS effect only take place in materials where twinning stress is smaller than the stress produced by magnetic field. Addition of Co instead of Ni, within the ternary Ni-Mn-Ga system, results in reducing the tetragonality of the martensite unit cell and consequently to decrease the twinning stress. However, this chemical modification also brings undesirable effect of decreasing the transformation temperature, which obviously becomes a major drawback for potential application. On the other hand, this effect could be compensated by adding a fifth element, which strongly increases martensitic transformation temperature (e.g. replacing Ga or/and Mn by Cu). Recent papers suggests that a six-component Ni-Co-Mn-Fe-Ga-Cu alloy can exhibit MFIS effect at elevated temperatures. In this project, starting from the ternary Ni-Mn-Ga system, three additional elements will be added in different proportions, i.e. Co, Fe and Cu. Their influence on the type of crystal structure, lattice parameters and characteristic transformation temperatures, will be determined. In order to register changes in properties caused by chemical composition adjustment, advanced research techniques using electron and X-ray diffraction phenomena will be used. Microstructural observation will be made using scanning and transmission electron microscopy. The characteristic transformation temperatures will be determined using differential scanning calorimetry method. Based on obtained results, the most promising composition for exhibiting MFIS effect will be selected. Moreover, for the selected composition, a single crystal will be grown using a modified Bridgman method the. Due to, the research carried out in this project, we will gain insides regarding new materials potentially exhibiting the MFIS effect, which is an important element of the future applicability of these materials. The obtained results will be published in well-known scientific journals and also will be announced at local and international scientific conferences and seminars.