Project is focused on optimizing the production process of Ni-Mn-Ga-based alloys using the melt-spinning technique in order to obtain material in the ribbons form that has the magnetic field-induced strain (MFIS) effect. The Ni-Mn-Ga-based Heusler alloys are extensively studied materials, because of their unique functional properties, such as: MFIS, conventional shape memory and magnetocaloric effects.

Over the period of 20 years, much afford was done to understand the fundamental physical properties, which cover the MFIS phenomenon as well as other functional properties observed in Ni-Mn-Ga-based alloys. Further important results were achieved due to, the chemical composition modification of the ternary system by doping other elements, e.g. 12% of longitudinal strain observed in Ni-Mn-Ga-Co-Cu single crystals with the 2M martensite crystal structure. Chemical modification by shuffling the ratios between three constituents only or by the addition of other metals has also led to enhance functional properties of the material.

The giant MFIS effect was experimentally verified in Ni-Mn-Ga-based single crystalline materials. This value of longitudinal strain have reached maximum theoretical calculations, which are a function of lattice parameters of a particular martensite unit cell. However, the single crystal growth technology is not widely available and it is also time consuming. This may be a dominating barrier in the case of future large scale industrial applications, That is why, there is an increasing interest in the shape memory community to produce Ni-Mn-Ga-based materials by different production techniques, which may result in a variety of unique properties. The MFIS effect has been recently found in forms other than the single crystal, such as: foams, microwires, micropillars, etc. The melt-spinning is one of these techniques, that allows fast production of the material in a form of ribbons. Taking into account the recent advances, particularly the discovery of MFIS effect in the Ni-Mn-Ga-Co-Cu single crystals, this project is aimed at optimizing the production process and in-depth structural analysis of these alloys in the ribbons form in terms of the possibility of this phenomenon occurring mainly as a result of modification of the production process.

The possibility of inducing MFIS effect in Ni-Mn-Ga-based melt-spin ribbons would be very important for the shape memory community. This property has not been obtained in Heusler alloys produced by this technique. The high level of brittleness of the ribbons is a major drawback to induce the MFIS effect. Our preliminary results indicate that the Ni-Mn-Ga-Co-Cu alloys are ductile and thus, are very promising candidates for MFIS applications.