DESCRIPTION FOR THE GENERAL PUBLIC

Magnesium based alloys are recently one of the most attractive metallic materials for structural and functional applications in automotive and electronic industries due to low density and high specific strength. Nowadays, mainly cast magnesium alloys are widely used whereas wrought alloys are not as common. The main reason of their limited usage is low ductility and poor formability resulting from unsatisfactory number of independent slip systems. The extensive research has been conducted for recent years on various forming methods of Mg-based alloys and different alloying elements which could increase their formability. Many literature reports indicate that Mg-Sn alloys may exhibit superior mechanical properties in comparison to conventional Mg-Al-Zn alloys due to the lowered stacking fault energy.

Conventional plastic forming methods of magnesium alloys like symmetric rolling give rise to a strong texture, basal texture (0001) in the case of rolled sheets, what leads to their limited formability at further processing steps. Since the basal texture strongly affects the formability of magnesium, the one way to improve it is the weakening of texture intensity by introducing intense shear deformation. For this purpose, the project author has decided to apply the differential speed rolling (DSR) method. The proposed project is focused on plastic deformation of two newly developed Mg-Sn alloys (Mg-6Sn and Mg-6Sn-1.5Zn) by DSR process. Scientific problem of the project is an explanation of the effect of introduced shear stresses on formability of Mg-Sn alloys and characterization of the main deformation mechanisms under such processing conditions. The obtained results will create scientific basis to conscious shaping of the microstructure and texture of Mg-based alloys in order to obtain products with enhanced ductility. To prove the hypothesis stated within the project, it is planned to examine the microstructure and texture of the processed Mg-Sn-based sheets using advanced microscopic techniques, i.e. scanning and transmission electron microscopy and electron backscattered diffraction method (EBSD), and texture analysis techniques. The enhanced ductility and formability will be characterized by uniaxial tensile tests and sheet metal forming tests using Erichsen method at room and elevated temperature.

The problem of poor formability of magnesium alloys lays in the center of interest in many research institutes around the world, therefore the results obtained within this research project will allow to create scientific basis for the better understanding of deformation mechanisms of Mg-Sn alloys and the effect of shear stresses on microstructural and textural changes in magnesium alloys. This knowledge may contribute to development of magnesium alloys with enhanced ductility and formability and optimization of their processing parameters to expand the range of their potential applications.