Metallic glasses are modern engineering materials and are characterized by very unique properties. They belong to the group of materials with amorphous structure – unlike most metals and their alloys they do not show the atomic order regularity in the material's structure. Due to the fact that metals spontaneously tend to crystallize in regular atom arrangement, special chemical compositions of alloys and production techniques, e.g. very rapid cooling during casting have to be used to produce metallic glasses. In view of these limitations, first metallic glasses were produced in form of thin foils and then ribbons and their application was mainly focused around their excellent soft-magnetic properties. Nowadays, with the progress in selection of chemical composition, it is possible to produce so called bulk metallic glasses (BMG) which can be increasingly used because of their other properties like high strength or high corrosion resistance. These characteristics of BMG, combined with simple production of details with complex shapes and with high surface quality in the way of forming of subcooled liquid, indicate the potential broad use of this group of materials in modern engineering techniques being developed.

The aim of the project is to analyze the zirconium-based bulk metallic glasses' surface modification through the diffusion of nitrogen and oxygen using processes conducted in low temperature plasma. Amorphous materials (alloys from Zr-Cu-Al-Ag and Zr-Cu-Al-Ni systems) will be subjected to nitriding and oxynitriding processes under glow discharge conditions and the layers will be characterized in terms of phase and chemical composition as well as microstructure and surface topography and morphology. Furthermore, research on their properties, like hardness, wear and corrosion resistance will be carried out.

Research planned in the project have a great cognitive value and will result in the elaboration of nitrided and oxynitrided surface layers production using low temperature plasma on zirconium-based bulk metallic glasses – potentially with the preservation of their amorphous structure - and in the determination of nitrogen and oxygen diffusion mechanisms in these materials with the possible analysis of its influence on phase composition and amorphousness of bulk metallic glasses' structure as well as on properties of produced surface layers.