

The aim of the proposed project is to develop an additive manufacturing method, the so-called 3D printing of gradient materials by mixing nickel and cobalt alloys, which will lead to obtaining new materials with increased strength and resistance to oxidation at high temperature. Metallic gradient materials with a chemical composition changing in a specific direction due to mixing two alloys in different proportions are characterized by a gradual change in properties along this direction. Such materials have great potential for application in various fields, e.g. in energy, aviation, automotive, biomedical engineering and optoelectronics. In order to produce gradient materials with the expected properties, it is necessary to solve problems related to the formation of defects and inhomogeneities that occur during their production using conventional methods. The use of additive manufacturing in the process of laser powder bed fusion significantly facilitates the production of gradient materials by mixing powders of metal alloys with different chemical composition. This opens up new perspectives for the production of gradient metallic materials with a designed chemical composition and unconventional shaping of their microstructure in order to obtain the expected properties. In this project, gradient materials will be additively manufactured by combining nickel and cobalt alloys designed for high temperature operation. Additionally, thanks to the possibilities of controlling the conditions of the additive process, zones of different grain size will be introduced into the gradient materials. Such a combination of a chemical composition gradient with a deliberately shaped microstructure inhomogeneity will lead to obtaining the expected different mechanical properties and oxidation resistance along the direction of manufacturing the gradient material.