Magnesium, zinc and calcium alloys are the modern materials used in the medical industry as inter alia surgical sutures, orthopedic implants or terminal blood vessels. Biomedical use of these materials is mainly due to their properties of which can be distinguished: biocompatibility, biodegradability, suitable mechanical properties, as well as electric and magnetic properties. Further, an advantage of these alloys is easy manufacturing and processing along with relatively low price. Despite the many advantages of the described materials, there is still a problem due to the high reactivity of magnesium. It concerns too rapid dissolution of these alloys in a physiological medium. In order to reduce this phenomenon, materials can be affected in different ways: by applying a protective coating material, modifying the chemical composition of the respective alloying elements or by modifying the internal structure of the material. Following continuous attempts to improve the corrosion resistance of biocompatible magnesium alloys, it was decided to focus on this phenomenon and at the same time find the relationship between the degree of crystallinity of the material and its properties. The objective of this project is the development of alloys based on the Mg-Zn-Ca system modified with alloy elements in a way allowing to control the degree of crystallinity of their structure, which will allow to predict the rate at which they undergo biodegradation. It is planned to find the exact relationship between the composition of alloys, the degree of their structure crystallinity at given preparation parameters, and their corrosion resistance.

The first stage of the research will be the design of chemical composition and selection of the alloying parameters. Then, with the use of a diffractometer a degree of crystallinity of the material will be specified. Then, with use of differential scanning calorimetry, thermal effects occurring in the material will be analyzed. Studies will also include microscopic observation using a light microscope and scanning electron microscopy. Corrosion testing is carried out in imitation of body fluid (SBF). It is also planned to conduct tests of mechanical properties of the materials. It was planned that these will be micro-hardness and resistance to compression measuring. To determine the relations between the structure and properties of the materials tested, correlation analysis of individual production parameters will be carried out, and hence the structure of materials and properties of alloys. The results obtained will be benchmarked to the characteristics of the materials of the Mg-Zn-Ca available in the literature.