Many investigations have been carried out on the titanium alloys surface functionalization, which can be applied as a dental implant. Titanium alloys like Ti-xMo, Ti-xNb-xZr-xTa are considered as a future dental materials. These titanium alloys are composed on biocompatible compounds and exhibit mechanical properties close to human bone tissue. Physicochemical properties and corrosion resistance of the titanium alloys are much better compared to titanium and its Ti-6Al-4V alloy used in medicine. The surface of titanium alloys can be functionalized using cost-effective and easy electrochemical and physicochemical techniques.

One of the techniques for surface modification is anodizing. The porous oxide layer formed on the surface by plasma electrolytic oxidation (PEO) enhance integration between material and bone tissue. In the porous oxide layer the chemical compounds can be incorporated from solution. The morphology of the porous oxide is also favorable for osteoblast cells adhesion and proliferation. Beside many advantages of the PEO process, the bioactive substances, such as drugs, cannot be incorporated into oxide layer. The substances will be destructive during the sparks occurs during the process.

The presence of the implant surface active substances is important due to possibility of post infection after material implantation into bone. Septic infections are one of the reasons for failure of the material. Infections within the dental implant can cause aerobic and anaerobic bacteria. Strains like *Staphylococcus aureus (S. aureus), Staphylococcus epidermidis (S. epidermidis*), *Pseudomonas aeruginosa (P. aeruginosa)* cause infection. Thus, it is important that the surface of an implant will be resistant to bacterial adhesion and biofilm formation.

Aim of the project is formation of porous oxide layer and fast degradable polymer with biologically active substance on the novel titanium alloys surface. The oxide polymer layer will be formed on the Ti-xMo and Ti-xNb-xZr-xTa alloy surface by plasma electrolytic oxidation. Then the fast degradable polymer layer with drugs will be deposited via deep coatings methods. From the polymeric layer the drugs will be release into physiological solutions up to 4 weeks.

There are many polymers which degrade in physiological solution, and products of their degradation are not toxic for organism. Bioactive substance (antibiotic) may be deposited on the porous oxide layer with fast degradable polymeric layer.

In the project 4 various drug will be chosen, due to their different biologically activity and activity on bacteria strains. The polymer layer with drug will exhibit antibacterial properties, when porous oxide layer will be enhance osteoblast cell proliferation and integration of implant with bone.

Formation of biohybrid layers with drugs will be an innovative way for the titanium alloys surface modifications. The basic physicochemical and electrochemical properties of the obtained materials will be determined. Biological investigation include determination of cytocompatibility and bioactivity of the materials, using osteoblast-like cells line MG-63 and mesenchymal steam cells. The antibacterial investigations will be carried out using reference and clinical bacterial strains.