Titanium and its alloys are widely used in the aerospace, automotive, shipbuilding, chemical and biomedical industries, because of the unique combination of properties: high strength-to-density ratio and corrosion resistance. Nevertheless some properties limit the application of these alloys as structural materials, especially the tendency to surface adhesion and galling, which results in lower wear resistance. Use of titanium alloys in frictional assemblies and direct contact friction devices is impossible without further surface treatment. A proposed solution was gas nitriding, which indeed lowered surface wear. However, during this treatment the roughness increases and the strength of the core material is to some extent compromised. The most important property of this alloy is degraded due to the necessity for its long-term exposure to temperatures only slightly below the $a \rightarrow b$ transformation point. It is possible to influence the properties of the nitride layer by surface cold working, e.g. by prior slide burnishing. This significantly increases the scope for synergistic formation of the surface layer structure of titanium alloys.

The aim of the project is to understand the role of crystal lattice defects introduced by plastic deformation of near surface regions (slide or roller burnishing) in the nitriding process of titanium alloys performed at temperatures lower than usual for those types of treatments. Gaining from synergy of the applied treatments, which are complicated, can be done only by first understanding in which way plastic deformation affects the mechanism of nitriding. This requires basic research involving characterization of microstructure and phase composition of each processing step of surface layer modification of titanium alloy.

The methodology adopted in the project involves the implementation of eight tasks, in which surface layer morphology will be studied by optical / scanning electron microscopy and TEM / STEM methods. At the same time roughness, hardness, Young's modulus and wear resistance will be measured at every stage of the surface layer modification.

The obtained results will help to answer the fundamental question of the role of crystal lattice defects introduced by plastic deformation of near surface regions on the nitriding process of titanium alloys performed at temperatures lower than usual for those types of treatments.