The rapid development of new technologies, leading to miniaturization of devices used in everyday life (i.e. integrated circuits or optical data transmission technology), as well as the prospects of new technologies (such as integrated circuits based on organic molecules or building memristors) causes a great interest in basic research in nanoscale. Scientific activity of applicant group covers various aspects of modern engineering materials and properties of nanoscopic material systems.

The main objective of the present project is to understand the origin of few phase formation on reduced surfaces of ternary perovskite-type crystals ($SrTiO_3$, $BaTiO_3$, $CaTiO_3$, $KNbO_3$) emerging after annealing to high temperatures in the controllable oxygen pressure conditions. Controlling the properties of the surface region of perovskite-type materials is of high importance in the field of future energy and information technologies. A common method to modify the surface of perovskite oxides such as SrTiO3 is annealing under vacuum conditions. The authors of the present project have already showed that the local oxygen partial pressure near to the surface plays a crucial role during the annealing. While the oxide is found to be macroscopically stable during high-temperature reduction under standard vacuum conditions and only segregation effects on the nanoscale seem to take place, surface decomposition due to incongruent sublimation occurs as soon as an oxygen getter such as Ti is positioned close to the oxide. In consequence, owing to the high volatility of Sr-containing species at very low oxygen pressures, a TiO surface nanostructures are formed. This effect might reveal an alternative possibility to tailor composition and structure of perovskite-type titanate surfaces. Titanium monoxide finds an application also as a support for organic films and also for memristive devices fabrication. Unfortunately up to now TiO fabrication in nanotechnology is mostly based on costly top-down techniques, relying on laser, ion or electron beam induced formation or needs an enormously high temperature of 2000^{o}C. The new way of controllable and scalable manufacturing of crystalline titanium monoxide is thus needed and we, in this project, respond to these expectations