During the recent years, TiO_2 and WO_3 - based nanomaterials have become a subject of great scientific interest due to their unique semiconducting properties that make them very promising materials for various modern applications, e.g., in photocatalysis, photovoltaic cells and photosensing devices. A significant drawback that often limits the practical application of such nanomaterials could be a relatively high cost of their fabrication. Therefore, many scientific efforts are focused on the design and optimization of versatile and inexpensive methods for nanomanufacturing. Among many different strategies that have been already proposed for fabrication of nanostructured semiconducting oxides, their simple growth on the metallic substrate during controlled anodic oxidation (anodization) seems to be a very promising and perspective approach. For instance, it is widely recognized that simple anodic oxidation of Ti in fluoride ion-containing electrolytes can result in formation of well-ordered of nanoporous or nanotubular anodic titanium oxide (ATO) layers. An example of such kind of TiO_2 layer is shown in Fig. 1.

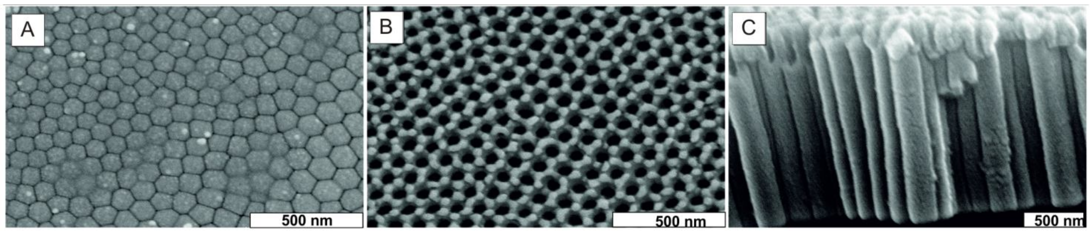

Fig. 1 SEM (A) bottom-,(B) top- and (C)cross sectional views of ATO layers formed during anodization in the electrolyte containing fluoride ions.

Moreover, the morphology of such kind of anodic titanium oxide (ATO) layers is strongly dependent on the conditions applied during anodization, so it is possible to precisely design the morphology of anodic layers by choosing of appropriate electrolysis conditions. Similar types of nanostructured WO_3 layers can also be obtained in simple anodic oxidation of metallic tungsten. In addition, photocatalytic performance of such kind of nanostructured semiconductors can be significantly improved by their further modification with another semiconductor (e.g., other transition metal oxide)

Therefore, the main objective of the proposed project is to develop and optimize the simple and versatile method for fabrication of nanostructured anodic TiO_2 and WO_3 doped/modified with transition metal (Co, Cu, Fe) oxides. To achieve this goal, nanostructured anodic oxide layers will be synthesized by a controlled anodization of Ti and W foils. Three different strategies will be employed to obtain doped/modified oxides: (i) direct formation of modified TiO_2 or WO_3 by simple anodic oxidation carried out in electrolyte containing transition metal ions; (ii) simple electrochemical deposition of particular metals (Co, Cu, Fe) on the surface of nanostructured anodic oxides followed by their conversion to oxides; (iii) wet impregnation of anodic oxides with solutions containing transition metal ions.

Extremely important part of the project will be complex characterization of morphology, composition, structure and properties of as obtained materials in order to check if there is any correlation between conditions applied during their fabrication and their photoelectrochemical activity, so if it is possible to precisely design and obtain material with the desired properties.

Finally, as obtained materials will be examined as new generation photoelectrochemical sensors for a precise and accurate determination of glucose. This kind of sensors can be extremely useful e.g., in the detection of the glucose level in blood.