Novel and efficient renewable energy sources, supercapacitors, water-splitting devices or batteries with high capacitance, as well as various sensors are hot topics within the society and at the same time challenges for the scientific community. The latest approach and dynamic development in these fields benefit from material research at the nano-size level. Following this path of nano-world development, the project **aims on** fundamental material research on **semi-transparent nanostructured surfaces with complex 3D geometry for enhancement of light harvesting and label-free sensing**. In this project we want to establish a bridge between advanced thin film deposition techniques and electrochemical titania nanotube arrays fabrication onto surfaces with complex 3D geometry for smart light management and label-free detection. **Titania nanotube arrays with tunable absorption light spectra due to tailoring of the band-gap and nanotube dimension will be studied**. We will also focus on enlarged surface of the material when nanotubes are achieved, what enhances interactions with an analyte for sensing purposes. Well-defined nanotube arrays will be formed on surfaces with complex geometry to achieve unique light-matter interacting systems.
In particular, **a double-faced nanotube-array-based system with sequential light absorption** (Fig. 1a) and a**n optical-fibre-based sensor coated with nanotube arrays for label-free sensing** of various gases and liquid analytes (Fig. 1b), will be fabricated and investigated. The synergy effect between material property, surface nanoarchitecture and substrate geometry will be studied towards understanding of smart light management.

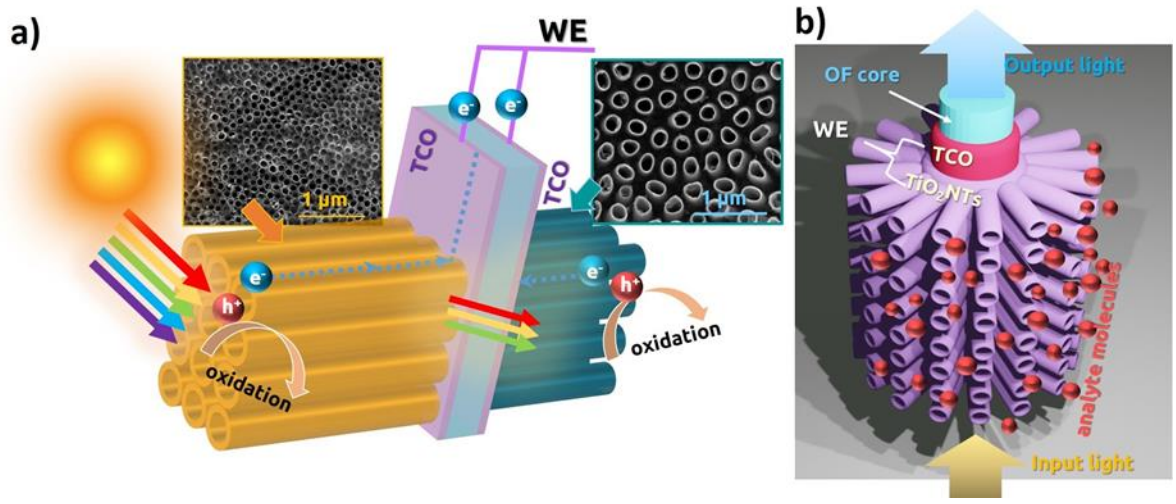

Fig. 1. Scheme of the project outline: showing a) double-faced electrode layers for sequential, cascade-like, light harvesting, and b) optical-fibre with nanotube arrays for label-free sensing.

Key words

Titania nanotube-arrays; anodization; plasma assisted deposition; doped titania; nanoparticles; band-gap tailoring; light-harvesting; optical-fibre sensor; label-free sensing; enzymes and proteins;