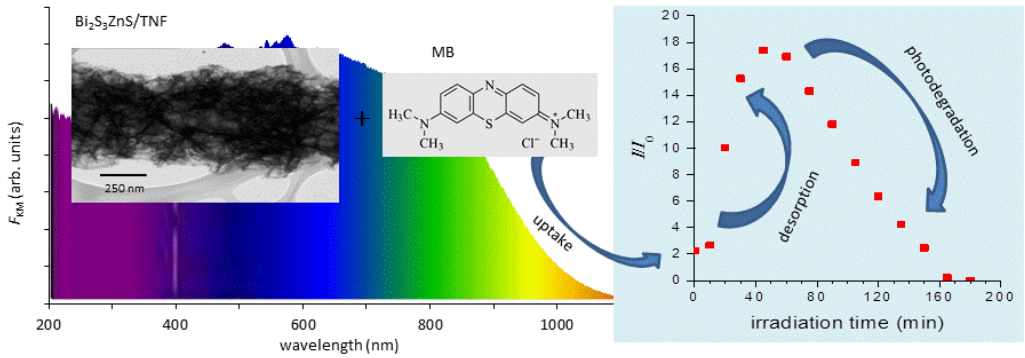
Titanate nanofibers co-sensitized with ZnS and Bi2S3 nanocrystallites for pollutants removal



Synthesis of titanate nanofibers co-sensitized with ZnS and Bi2S3 nanocrystallites and their application on pollutants removal, T.J. Entradas, J.F. Cabrita, B. Barrocas, M.R. Nunes, A.J. Silvestre, O.C. Monteiro, Mater. Res. Bull. 2015, 72, 20-28.

The use of nanocrystalline semiconductors as photocatalysts, on the treatment of industrial wastewaters, has generated great interest, due to their unique physicochemical properties.

In particular this project aims TNTs manipulation by surface sensitization processes, through the synthesis of nanocomposite materials combining titanate nanofibers (TNF) with nanocrystalline ZnS and Bi_2S_3, in order to obtain nanocomposite materials with new and improved photocatalytic performances. The TNF were produced via hydrothermal synthesis and sensitized with the semiconductor nanoparticles, through a single-source precursor decomposition method. ZnS and Bi_2S_3 nanoparticles were successfully grown onto the TNF's surface and Bi_2S_3–ZnS/TNF nanocomposite materials with different layouts. The samples' photocatalytic performance was first evaluated through the production of the hydroxyl radical using terephthalic acid as model molecule. All the tested samples show photocatalytic ability for the production of this oxidizing specie, very important in the photodegradation of organic pollutants. Afterwards, the samples were investigated for the removal of methylene blue. Methylene blue is an industrial dye, used often as model pollutant in photocatalytic degradation studies. From the nanomaterials materials studied, the nanocomposites with best adsorption ability were the ZnS/TNF and Bi_2S_3ZnS/TNF. The most promising results, for the complete pollutant removal, were obtained considering a sequential combination of an adsorption-photocatalytic degradation process using the Bi_2S_3ZnS/TNF powder as a highly adsorbent and photocatalyst material.