

Physics Department

Photofunctionalized oxide films

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1996- Graduation in Chemistry, FCUL.
1998- MSc in Science and Surfaces Engineering, FCT/UNL.
2004- PhD in Physics, Condensed Matter Physics, UL.

Objectives

Development of photofunctionalized oxide films and nanocomposites by DC-magnetron sputtering for environmental applications:

- $\text{Ca}_{1-x}\text{Sm}_x\text{MnO}_3$ and $\text{Ca}_{1-x}\text{Ho}_x\text{MnO}_3$ film photocatalysts or electrodes produced by RF-magnetron sputtering from compacted nanosized powder targets.
- Photocatalytic immobilized MO_x -based thin films ($M = \text{Ti}, \text{W}, \text{Pb}, \text{Mo}, \text{etc}$), nanocomposites (TiO_2/WO_3) for photo and electrochemical degradation.
- Characterization of the crystalline structure, morphology and optical properties.

Methodology

The sputtering technique presents several advantages on electrodes/ photocatalysts preparation such as high deposition rates, high-purity films and extremely high adhesion film/support.

The perovskite electrodes are fabricated on conductor substrates (ITO, FTO or Ti) by RF magnetron sputtering from compacted nanosized powder targets with the desired stoichiometry using a cathode prototype specially developed for this type of materials.

Use of reactive DC discharges for the production of immobilized MO_x -based thin films ($M = \text{Ti}, \text{W}, \text{Pb}, \text{Mo}, \text{etc}$).

Characterization of materials by several techniques (X-ray diffraction, SEM/EDS, TEM, XPS, optical properties, VUV spectroscopy, and others).

Expected Results

It is expected to develop and study new photofunctionalized thin films (perovskite and other oxidefilms) with a suitable design and properties for photochemical applications, namely as photocatalysts and photoelectrocatalysts for water purification, in order to use the natural resources in a sustainable way.

As a result, it is intended to set up reliable elimination technologies as an alternative for those implemented nowadays, leading to significant environmental and economical benefits with potential impacts in the entire Portuguese territory, particularly in industrial areas.

