EPR characterization of new materials for water pollutants degradation (Mat4treaT project)

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Mat4treaT is a Marie Sklodowska-Curie RISE project funded by the European Commission. The project involves eight Universities and two non academic institutions from Italy, Spain, Denmark, Greece, Canada, Argentina and South Africa committed to work in the development of novel materials to be used in innovative integrated water tertiary treatments for organic pollutant removal\(^1\).

Materials developed in the project include several oxides, polymeric and inorganic membranes, graphene-oxide and bio-based substances extracted from urban waste. Furthermore, several composite materials such as Si-Fe magnetic nanoparticles, functionalized silica monoliths, silica grafted photoactive substances or TiO\(_2\)-protein biocatalysts are synthesized and applied to different pollutant removal problems\(^2-6\).

Both the materials and the processes were characterized by different EPR techniques. In particular, photocatalytic and other redox processes were studied by spin trapping in the presence of DMPO and 4-oxo-TMP, for the identification of hydroxyl radical and singlet oxygen, respectively. Whereas the charge separation occurring during the irradiation of solid oxides and the consequently formation of holes and electrons were followed by solid state EPR measurements. Different semiconductor oxides (bare and doped) have been irradiated with UV and visible light under vacuum and in presence of oxygen atmosphere. In the former case it was possible to verify the formation of holes and in the latter one the formation and reaction of electrons.

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References.
1. Further information are available on the project website: www.mat4treat.unito.it