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Editorial

Introduction by the Guest Editors

The last advances in water purification have concerned the oxidation of persistent organic compounds dissolved in water, generally refractory to common detoxification processes The methods based on catalysis and photochemistry have been included in new technologies, denominated Advanced Oxidation Processes (AOP). Among them, those which produce highly degrading hydroxyl radicals ($^{\bullet}$OH) have been successfully developed. Because of the strong oxidative nature of this compound ($E^0 = 2.8$ V), which is much greater than that of other traditional oxidants (e.g. ozone: 2.07 V, hydrogen peroxide: 1.78 V, chloride dioxide: 1.57, chlorine: 1.36 V, etc.), $^{\bullet}$OH radicals are able to completely mineralise organic carbon into CO_2. Methods based on H_2O_2/UV, O_3/UV and H_2O_2/O_3/UV combinations utilise photolysis of H_2O_2 and ozone to produce such hydroxyl radicals. However, these radicals can also be generated (i) by a UV-irradiated semiconductor, when in contact with water, or (ii) by the Photo-Fenton process, where Fe^{2+} ions are oxidized by H_2O_2 thus producing one $^{\bullet}$OH and one Fe^{3+} ion, which then act as a light absorbing species that produces another $^{\bullet}$OH radical and regenerates the initial Fe^{2+} reactant. Both processes are of special interest since they can use solar light.

The Solar Department of CIEMAT-DER (Renewable Energy Department) and the Plataforma Solar de Almería (PSA), main research center of DER and the largest European facility on Solar Energy Applications, have been participating in the chemical application to water solar detoxification since 1990, in particular in projects of photocatalytic decontamination of used water, both at national and international levels. The experience acquired on solar detoxification systems at the engineering level, led to the development and the installation at PSA of the largest European Solar Detoxification Facility at pilot plant scale that has been successfully used by many European Research Institutions. The Guest Editors of this special issue of Catalysis Today have estimated that it would be appropriate to bring together in a single volume some contributions from various representative institutions that have collaborated with PSA, in particular within the European 'Training and Mobility of Researchers (TMR) program'. It is also expected that this volume will illustrate the cross-linked synergistic relationships that have been developed between the different European Research Groups involved in the PSA photocatalysis research program during the last few years.

Sixteen papers are presented, involving 16 research institutions from six European countries: Poitiers-Fr, Lyon-Fr, Gifs/Yvette-Fr, Metz-Fr, Wien-At, Palermo-It, Torino-It, Lausanne-Ch, Hannover-Ge, Almería (3)-Sp, Madrid (3)-Sp, Barcelona-Sp. The work carried out can be divided into two main themes: (a) Solar Photocatalysis at pilot plant level (12 papers) and (b) complementary topics. This last theme has been included because of the high interest of presenting a few papers on other aspects that are complementary for Solar Photocatalytic Water Decontamination. They concern (i) advanced analytical tools applied to photocatalytic experiments (*Application of various analytical techniques*...); (ii) the combination of biological and photocatalytic methods (*Strategy for the coupling of photochem-*

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ical and biological...); (iii) the development of kinetic models for experimental results interpretation (*Kinetic analyses of photoinduced*...); and (iv) gas-phase photocatalysis (*Influence of temperature on gas-phase*...).

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