



Preface

This Special Issue of Catalysis Today includes selected papers presented at the 5th European Conference on Solar Chemistry and Photocatalysis: Environmental Applications (SPEA 5). The conference, held from 4th to 8th October 2008, was organized by Leonardo Palmisano and Vincenzo Augugliaro in Palermo (Italy). The 252 delegates (representing 757 authors) who came from many different European and non-European countries delivered four plenary lectures and 49 oral presentations. To emphasise the poster presentation, the 184 posters were briefly introduced by the appropriate Session Chairman before each oral session began.

Both oral and poster presentations were divided into the following five topics:

- Topic 1: Catalysts and processes for solar light utilization;
- Topic 2: Photodegradation in gas and liquid systems: catalysts, reaction mechanisms and processes;
- Topic 3: Photocatalyst developments: preparation, doping and characterization;
- Topic 4: Novel photocatalytic processes and process assessment;
- Topic 5: Photocatalysis: from fundamentals to applications.

The biennial SPEA Conference places strong emphasis on research in photochemical and photocatalytic processes able to use natural or simulated sunlight for environmental applications. This includes not only the possibility of abating pollutants present in liquid and gas effluents, but also their potential for Green Chemistry (mild experimental conditions, non-hazardous solvents and reagents, etc.) for organic syntheses that afford important chemicals.

Scarce or poor-quality water, the most important liquid on earth, creates serious social and health problems, especially in developing countries. Consequently, new fields of research proposing and testing innovative water treatment methods have been undertaken in recent decades. This is the case of advanced oxidation techniques (AOTs) which are able to eliminate biorecalcitrant pollutants that can otherwise be removed from water, but not eliminated. It is worth noting that volatile organic compounds (VOCs) in gas effluents, which are the cause of environmental and health risks, can be reduced or entirely eliminated by very promising gas-phase photocatalytic treatment.

Selection of the best photocatalyst is linked to its specific use, and studies focussed on preparation and testing of photocatalysts under various experimental conditions should continue, as TiO_2 , the most popular photocatalyst, has been shown to behave differently, depending on the chosen phase (anatase, rutile, and brookite), on the system (liquid–solid or gas–solid), on the physico-chemical surface properties and so on. Degussa P25

TiO_2 , for example, is very efficient for photodegrading organic and inorganic pollutants in liquid–solid systems, but it can be subject to deactivation in gas–solid systems after long reaction times. Moreover, for selective photocatalytic synthesis, it has been reported that in-house TiO_2 samples have fewer oxidizing properties and are more selective than some commercial samples.

Engineering design and operating strategies for efficient industrial use of photoreactors are the aspects to be addressed. The most important design problem for such large-scale reactors lies in achieving uniform irradiation of the entire catalyst surface with the same incident intensity. The near impossibility of accomplishing this substantially diminishes the incident energy, and thereby, also worsens overall economics. Scale-up studies must be directed at achieving uniform irradiation and minimal loss of the incident light due to opacity, light scattering, absorption by liquid, etc.

We believe that the 30 papers included in this Special Issue represent a good (although not exhaustive) overview of the state of the art of the Conference's five topics. In our opinion, a special interdisciplinary approach is essential to face the future challenges related to the use of sunlight for environmental applications. The solution to today's specific problems can no longer be solved from any single discipline, but requires the cooperation of biologists, engineers and chemists working together, jointly analysing them from different viewpoints.

Finally the Editors would like to thank the authors and referees, as well as the institutions and companies that sponsored SPEA5, for making this Special Issue possible.

Vincenzo Augugliaro^a

Leonardo Palmisano^a

Sixto Malato^{b,*}

Wolfgang Gernjak^c

^a"Schiavello–Grillone" Photocatalysis Group,
Dipartimento di Ingegneria Chimica dei Processi e dei Materiali,
Viale delle Scienze, Università of Palermo, 90128 Palermo, Italy

^bPSA (Plataforma Solar de Almería), CIEMAT,
Crta Senés km 4, Tabernas, Almería 04200, Spain

^cThe University of Queensland, Advanced Water
Management Centre (AWMC), Qld 4072, Australia

*Corresponding author. Tel.: +34 950387940; fax: +34 950365015

E-mail addresses: augugliaro@dicpm.unipa.it (V. Augugliaro)

W.Gernjak@awmc.uq.edu.au (W. Gernjak)

Sixto.Malato@psa.es (S. Malato)

palmisano@dicpm.unipa.it (L. Palmisano)

Available online 3 April 2009