Chemistry and Processes for the Design of Metal Oxide Nanoparticles

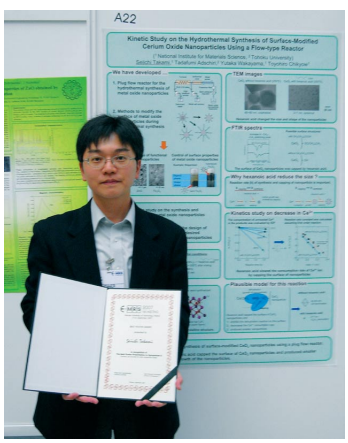
This special issue gathers selected contributions from participants of *Symposium A: Chemistry and Processes for the Design of Metal Oxide Nanoparticles* at the EMRS Fall Meeting 2007 that was held in Warsaw (September 17−21).

This symposium proved to be a success since it was the biggest with 133 participants, 50 oral contributions, including 14 invited, and 80 posters. As increasingly usual at the Fall Meeting, it attracted many researchers not only from Poland, France and Germany, but also from other western or eastern European countries and, significantly, even from South Korea and Japan.

Worldwide Participation

A broad spectrum of processes to make simple or complex nanoparticles was covered in the symposium. Solution chemistry was dominant, but flame spray processes were also well represented in several oral communications including one by S. E. Pratsinis as invited speaker. In the area of wet chemistry, independent of the reaction system (aqueous, nonaqueous or combinations of both), two points were particularly highlighted: the choice of precursors/solvent and the heating technique to initiate thermolysis. The objectives were to obtain quantitatively well-defined simple or multicomponent particles (e.g. core-shell or functionalized) in a process approach of "raw" materials production or to access sophisticated nanostructures or hybrid materials directly, sometimes deposited and self-assembled on substrates, depending on the specific application. An important concern was to minimize the number of steps, to target one-pot (or one-step) large-scale syntheses. These points were illustrated by invited talks that discussed recent advances in microwave-assisted synthesis in ionic liquids by C. Feldmann, non-hydrolytic sol−gel syntheses by T. Hyeon and by R. Seshadri, and sonochemistry, microwave-assisted syntheses and reactions under autogenic pressure at elevated temperature by A. Gedanken. More specific issues about size and morphological control by physicochemical conditions, organic additives or templates were also considered for example by C. Chanéac, M. Epifani and D. Zitoun.

Wet Chemical Processes



Poster prizewinner, S. Takami

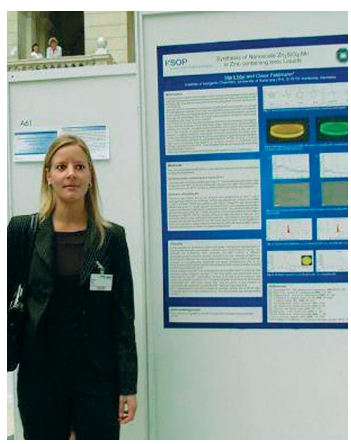
Nonaqueous Chemistry

The efficiency of sol−gel techniques coupling organic and inorganic chemistry to build nanostructured inorganic and hybrid materials was evidenced in talks by C. Sanchez and B. Smarsly. The fact that many applications require a fine control of interfaces and heterostructures was discussed by M. Graetzel in the case of mesoscopic solar cells and by H. Weller in various topics including biocompatible nanodevices for drug delivery.

Size and Morphological Control

Among the variety of oxides exhibited in the symposium, titanium dioxide was the most studied material, mostly for applications in photocatalysis. Its production and doping were described in practically all the key processes of the symposium.

As a symbol of the balance between the concern for process improvements and intensification on the one hand and the richness of nonaqueous chemistry on the other hand, a poster award was granted ex aequo to S. Takami for continuous hydrothermal process in a flow-type reactor to produce cerium dioxide nanoparticles and to M. Mai for microwave-assisted phosphor synthesis in ionic liquids.



Poster prizewinner, M. Mai

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