Poster

FORMATION OF MICRO- AND NANO-DIMENSIONAL DISK-SHAPE TiO_2 AND ZrO_2 PARTICLES AT AIR-WATER INTERFACE

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Low-dimensional metal oxides (*e.g. TiO_2*) have acquired great attention as compared with the traditional materials, nano-phase materials processes unusual chemical, optical, mechanical, magnetic and electrical properties [1].

In recent decade, sol-gel techniques in relation with materials chemistry have been extensively investigated and employed to explore new approaches in obtaining transition metal oxides in form of thin film layers, fibres or colloidal particles. Controlled synthesis of wide band gap pure and rare earth ions doped TiO_2 and ZrO_2 materials are of great interest since they can be used in gas sensorics [2], photocatalysis, electronics, photonic and solar cells. In almost all of these cases the dimensions and shape of these metal oxides is an important factor affecting the performance and application of the materials.

In present work we report a novel method for preparation of nano-dimensional undoped and rare earth ions doped circular TiO_2 and ZrO_2 particles (figure 1, 2). Disk-shape metal oxide particles were obtained by dropping solution of pre-polymerized metal butoxide solution in butahanole on air-water interface. Formed particles were 0.5-10μm in diameter and 20-80nm in thickness. Undoped and rare earth ions doped TiO_2 and ZrO_2 particles where heat treated up to 1000^{o}C for crystallization of material.

Current work include:

- Characterisation of formed particles by AFM and SEM visualization.
- Observation effect of water pH and temperature for the dimensions of formed particles.
- Observation the rate of polymerization of Ti and Zr alkoxides for the dimensions of forming particles.
- Some possible disk-shape-forming mechanisms are also proposed to explain the formation of observed novel structures.
- Presentation of some novel optical gas sensing properties of prepared samples.

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References:

[1] H. Gleiter, Progress in Materials Science, **4** (1989) 223-315.

[2] V. Reedo, S. Lange, V. Kiisk, T. Tätte, A. Lukner and I. Sildos, SPIE Proceedings, **5946** (2005) 5946 OD1-5.

Figures:

Figure 1. SEM image of TiO_2 disk-shape particles.

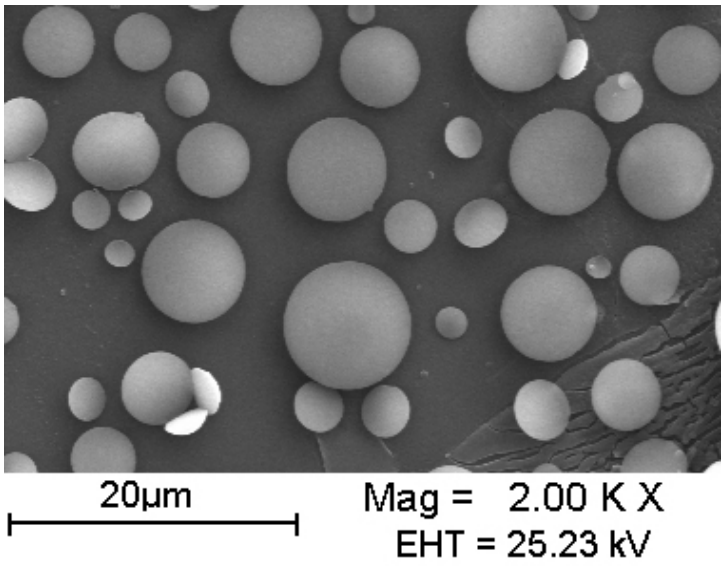

Figure 2. SEM image of TiO_2 disk-shape particles.