

# NEWS TRENDS IN SYNTHESIS OF NANOSTRUCTURED OXIDE POWDERS

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**Abstract:** New chemical methods such as hydrolyze, sol-gel process, hydrochemical synthesis or process in gaseous phase have been developed to synthesize nanostructured oxide materials. The classical routes for synthesis nanomaterials base on the solid state reactions at high temperature has many disadvantages due to the large diffusion distances. This paper presents the advantage of synthesis of oxide nanopowders by hydrothermal route and physical vapor deposition.

## Results and discussions

Important facts have been put in evidence in the present research, namely:

-The grain sizes derived from the recorded XRD patterns of nanometric powders vary with the crystallographic direction. It is to be noted that the (002) peak indicates that the coherency domains are lengthened in the direction of the c axis.

- A similar phenomenon seems to appear for the (200) peaks of the nanopowders, corresponding to a direction perpendicular to the c axis which is also enlarged. These results, apparently contradictory, could be interpreted as due to a mixture of particles, a part of them being elongated in a direction perpendicular to the c axis, another part parallel to the c axis.

- The expansion of the lattice of ZnO upon Al doping was clearly demonstrated and it can be explained assuming predominantly interstitial positions of these ions

- The scanning electron microscopy examinations of the powders synthesized under hydrothermal show the influence of the aluminum dopant content like in Fig. 1. With increasing aluminum content the morphology changes from flower like to spherical shape with a homogeneous distribution of the grain size.

-The formation of zinc oxide whiskers has been put in evidence in the products processed by solar physical vapor deposition, demonstrating the influence of the synthesis process.

- The solar PVD method is an original and powerful method to obtain Al-doped ZnO nanophases with controlled composition and morphology (from flower-like structure to nanowhiskers) and can be considerate a new trend to obtain oxide nanopowders.

- Combining hydrothermal synthesis and solar PVD method is a powerful method to obtain nanophases with controlled composition and morphology (from flower-like structure to nanowhiskers).

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