PLASMA DYNAMIC SYNTHESIS OF ULTRADISPERSED ZINC OXIDE AND SINTERING CERAMICS ON ITS BASIS BY SPS METHOD

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Zinc oxide is a well-known semiconductor material having good electrical, optical and catalytic properties. It can be used in different areas from cosmetics to drug delivery and biosensors. The synthesis of nanosized zinc oxide is an urgent task for obtaining ZnO-based ceramics with enhanced physical properties. This work shows the possibility to implement the plasma dynamic synthesis of zinc oxide in one short-term process (less than 1 ms) using an electrodischarge zinc-containing plasma jet, flowing into oxygen atmosphere. It allows synthesizing a mono-crystalline powder with particle size distribution from tens to hundred nanometers. The synthesized powdered product is investigated using by X-Ray diffractometry (XRD), scanning electron microscopy and high-resolution transmission electron microscopy. According to XRD, the obtained product consists of hexagonal zinc oxide with lattice parameters $a = b = 3.24982$ Å, $c = 5.20661$ Å that is clearly confirmed by microscopy data.

This powder was used to produce a bulk ceramics sample on its basis by spark plasma sintering. The influence of sintering parameters on the structure of the resulting sample was studied. The optimal parameters were found which allows obtaining the more dense ceramics with a better microstructure. It was also found that the absence of exposure time after reaching the working temperature and pressure allows decreasing the porosity of ceramics.

Keywords: *Coaxial magnetoplasma accelerator, Zinc oxide, Ceramics, Spark plasma sintering.*