SYNTHESIS OF SILICON CARBIDE NANOPOWDERS IN FREE FLOWING PLASMA JET WITH DIFFERENT ENERGY LEVELS

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Silicon carbide (SiC) due to its attractive properties such as high hardness and mechanical strength, low density, good wear resistance, together with excellent mechanical and chemical stability at high temperatures is widely used for producing abrasive materials, different kinds of wear- and heat-resistant ceramics. Different methods have been applied for obtaining silicon carbide nanoparticles and nanostructures but these methods do not allow to synthesize an optimal product. Plasmadynamic method is based on the use of a coaxial magnetoplasma accelerator (CMPA) as a plasma jet generator. The present paper reports the way of implementing plasmadynamic method by synthesis in a free flowing hypersonic plasma jet.The study was primarily concerned with investigating effect of changing plasma energy on a silicon carbide nanopowder. A supplied energy W was 11, 16, 21, 28 kJ at experiments with a charging voltage of 2.0, 2.5, 3.0, 3.5 kV respectively. Crystalline silicon and amorphous carbon black powders were used as precursors. The hypersonic plasma jet flowed into the argon atmosphere of working chamber. The powders synthesized by plasmadynamic method were analyzed without any pretreatment by X-ray diffraction, scanning (SEM) and transmission (TEM) electron microscopy. The results showed that the synthesized products mainly consist of β-SiC. Silicon carbide content increases (up to ~ 92 % mass) and particle sizes remain constant (~ 60 nm) with increasing plasma energy (11–28 kJ). Prisms with a triangular base which form the majority of the product were identified as crystals of silicon carbide.

***Keywords:** Silicon carbide, Nanopowder, X-ray diffraction, Transmission electron microscopy.*