APPLICATION OF THE CYCLIC REACTOR OF COMPRESSION FOR THE PRODUCTION OF THE SILICON CARBIDE NANOPOWDER[1]

B.S.EZDIN, V.V.KALYADA*, A.E.ZARVIN*, A.V.ICHSHENKO*, A.A.NIKIFOROV**

**Novosibirsk State University, st. Pirogova, Novosibirsk, 630090, Russia, bse@nsu.ru, +7(383)3634298*

The unique physico-chemical properties of silicon carbide, its use in nanodispersed form, allows to obtain new functional materials with predefined physical properties, including for the design of electronic components with high performance characteristics. Despite a rather large number of works, the problem of obtaining a nanoscale silicon carbide powder of the required parameters for purity, dispersion, productivity and other characteristics remains relevant.

There are a number of methods for obtaining a nanosized silicon carbide powder, such as sol-gel [1], laser pyrolysis [2], self-propagating high-temperature synthesis [3], plasma chemical method [4], adiabatic compression method [5]. The disadvantage of these methods is low productivity, the difficulty of scaling and the need to use expensive unique equipment, as a result of which the cost of nanoscale powders becomes high.

Our method uses a cyclic method of compressing the initial gaseous reagents of a mixture of gases SiH4, Ar and light hydrocarbons in the volume of a chemical reactor. The chemical compression reactor used is described quite fully in [6].

The passage of the SiC synthesis reaction was monitored on-line using a universal gas analyzer UGA-200. The samples were characterized by the HRTEM method using the JEM-2010 electron microscope equipped with the EDS spectrometer QUANTAX 200-TEM for local element analysis. In Fig. 1 shows typical electron microscopic images of the morphology and structure of the samples obtained.

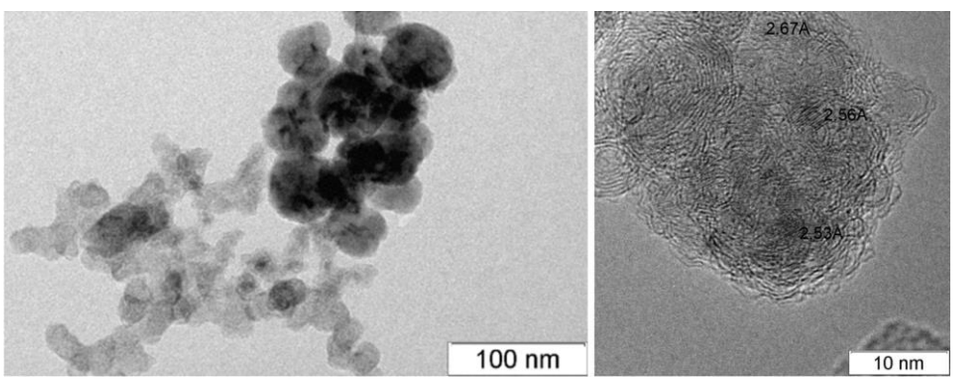

Fig. 1 Electron-microscopic images of particles of a sample of nanodispersed silicon carbide.

Dimensions of silicon carbide particles vary in the range of 10-40 nm. The observed interplanar distances correspond to silicon carbide from the XRD database.

The proposed method for obtaining nanoscale silicon carbide is convenient for technological execution. The process is cyclical and fully automatic. The degree of processing of the reagents reaches a high level. The product obtained during the synthesis of nanoscale SiC is chemically pure and is determined only by the degree of purification of the initial reagents, technological processes do not add additional contaminants to the product. The resulting product does not require further processing, as in most known methods and is ready for use in technologies and tasks of materials science.

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[1]The work was carried out using the equipment of the Center "Applied Physics" NSU with the financial support of the Ministry of Education and Science of the Russian Federation, grants 3.5918.2017 / ITR, 3.5920.2017 / ITR