Assessment of chemical inhomogeneity of nanodispersed diamond powders

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A degree of chemical inhomogeneity of surface of nanodispersed diamond powders is one of the most important factors that decide for field of application of the powders.

Chemical inhomogeneity of nanodiamond powders arises from the following features of diamond particles:

– in the first – the nature (character) and amount of volume impurities, that for the most part appear at the surface of the particles and generate active surface centers;

– secondly – the nature (character) and amount of chemical compounds and functional groups adsorbed on the surface of the particles. As a rule, volume impurities are admixtures of metals and metalloids that remain in nanodiamond powders after synthesis and follow-up chemical treatment. Surface impurities consist of the chemical compounds and functional groups (hydroxyl, carbonyl and carboxyl ones et al.) adsorbed on the diamond surface.

Electrochemical method of assessment of amount of conducting active centers is the principal method for assessment of chemical inhomogeneity of nanodiamond powders. The method bases on the determination of criterion K. We define criterion K as ratio of the area of effective conducting centers of initial surface of nanodiamond powder to the general surface of the powder. The less value of K the higher chemical homogeneity of nanodiamond powders, i.e. the better results of chemical treatment of the powders.

According to value of K the nanodiamond powders with reconstructed surface were segregated into three groups: 1) K = 1-5%, 2) K = 6-10% and 3) K > 10%.

The powders of the 1st group are the best for production of stable monosized suspensions.