Cluster models in small-angle scattering analysis of detonation nanodiamonds

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Various forms of detonation nanodiamond (DND) are characterized by cluster organization, which is well reflected in small-angle X-ray and neutron scattering [1-3]. The corresponding regions of the power-law type in the scattering intensity can be treated in the frame of the unified exponential/power-law approach [3], which allows us to follow changes in the fractal parameters of nanodiamond clusters under different conditions. Several models imitating the growth of fractal clusters are probed to understand the appearance of specific features in the scattering. Two- and three-dimensional cases for deterministic and stochastic fractals composed of nanoparticles with a finite size are considered. Both monodisperse and polydisperse basic structural units are used. It is shown that the Schmidt equation [4] for the small-angle scattering from mass fractals should be modified when applying to real systems.

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