STRUCTURAL ORGANIZATION OF NANODISPERSED ALUMINIC MATERIAL SYNTHESIZED IN A PLASMA REACTOR

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Microplasma generation technology is widely used for micro- and nanoparticles' synthesis from any material by a varying current, voltage and frequency [1]. In the course of a volumetric discharge in a liquid, cavitation and hydropercussion processes occur, as well as micro discharges, which lead to the formation of nanodispersed particles as a result of instantaneous evaporation of metals. This technology can also be effectively used for the purification of man-caused (chemically and radioactively) polluted waters [2,3]. Of great interest are studies of the effect of nanoparticles on the efficiency of polluted water treatment, when nanodispersed structures are synthesized directly in an impure liquid.
Here, the structural features of plasma-generated aluminum powder on the nanoscale are considered. Small-angle neutron and X-ray scattering (Fig. 1) made it possible to conclude about 40-nm primary particles with a diffuse surface, which are assembled into fairly compact aggregates (fractal dimension 2.8). The relationship between the structural and thermodynamic properties of the studied material is analyzed.

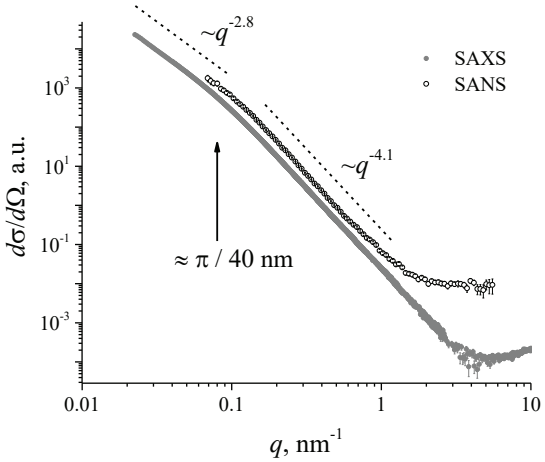

Fig. 1. Small-angle scattering data for nanodispersed aluminic powder. The characteristic power-law scattering regions are shown, as well as the crossover region between them, which is responsible for the nanoparticle size.

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[2] A. Zaporozhets (2022). Systems, Decision and Control in Energy III, Springer Nature.
[3] Yu. Zabulonov *et al.* (2015). New approaches to cleaning of liquid radioactive waste. Science and Innovation. 11, 47-58.