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SMALL-ANGLE NEUTRON SCATTERING OF MULTIWALLED CARBON NANOTUBES IN AQUEOUS SUSPENSIONS IN PRESENCE OF LAPONITE PLATELETS OR CETYLTRIMETHYLAMMONIUM BROMIDE

The results of small angle neutron scattering (SANS) study of semidiluted 0.1 and 0.3 % wt aqueous suspensions of multiwalled carbon nanotubes (MWCNTs) are reported. The additives of Laponite platelets or cationic surfactant cetyltrimethylammonium bromide (CTAB) were used for enhancing the dispersion ability of MWCNTs. At high values of wave vector q, ($1\ nm^{-1} < q < 3.5\ nm^{-1}$) all samples exhibited behavior characteristic for rigid rods (i.e., q^{-1} variation of neutron scattering intensity was observed). At low values of q ($0.1\ nm^{-1} < q < 0.5\ nm^{-1}$), the neutron scattering intensity followed the power law $q^{-\alpha}$ with exponent the α in the range of 1.2 - 2, depending on concentration of the Laponite platelets or CTAB. Addition of Laponite platelets or CTAB allowed improvement of dispersion ability of MWCNTs. The effects were optimal at the certain value of Laponite/MWCNTs ratio $X \approx 0.5$ or CTAB concentration (≈0.2 %wt). SANS also revealed existence of a mesh structure in MWCNT aggregates with characteristic mesh size of ≈7.4 nm and ≈6.3 nm in suspensions with concentration of 0.1 and 0.3 % wt of MWCNTs, respectively.

Keywords: SANS, elastic neutron scattering, nanotubes, Laponite platelets, CTAB.