

Physico-chemical nanomaterials science

Studies on the effect of pH on the stability of aqueous suspension of mechanochemically modified nanosilica

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Aqueous suspensions of fumed silica are perspective systems for applications in materials science, pharmacy, cosmetics. Therefore the problem of the sedimentation and aggregate stability is important.

Particle sizes and zeta potential of the suspension were measured with a Zetasizer Nano ZS90 Malvern firm device. The sedimentation stability has been investigated of aqueous suspensions of nanoscale silica (Kalush, Ukraine) containing 5, 3, 1, 0.5 and 0.2 wt%. of the solid phase. Such suspensions were prepared by mixing firstly in a mechanical mixer followed by and ultrasonic treatment a "Sonicator 3000" (Misonix, Japan). The geometrical modification (GM) of nanosilica A-300 ($S_{\text{BET}} = 300 \text{ m}^2/\text{g}$, $d_{\text{bulk}} = 50 \text{ g/l}$) was carried out by mechanical treatment (MT) in a ball-mill in a moist atmosphere containing 500 mg of water vapor per 1 g of SiO_2 . The volume of a ceramic ball mill was 0.5 dm^3 , filled by balls of 2–3 cm in diameter, number of rotations - 60 rpm. The mechanical activation was carried out 1 (LN-249/1), 2 (LN-249/2), 3 (LN-249/3), 4 (LN-249/4) and 5 (LN-249/5) hours. The obtained samples were dried at $50 \text{ }^\circ\text{C}$ for 3 h.

From measurements of zeta potential in water and electrolyte $0.001 \text{ mol} / \text{dm}^3 \text{ NaCl}$ it was found that in the pH range 3-7 the zeta potential decreases with increasing pH and shifts the values from 0 mV to -30 mV. The pHiiep of all tested samples s below pH <4. The ultrasonification of suspensions had an effect on particle size distribution.

Authors are grateful to People Programme (Marie Curie Actions) of the FP7/2007-2013/ under REA, grant agreement no. PIRSES-GA-2013-612484 for the support of this work.