Nanocomposites and nanomaterials

Silica-supported Ni_xO_y, Zn_xO_y and Mn_xO_y nanocomposites: electrosurface properties and interaction with water and n-decane

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A series of M_xO_y/SiO_2 (where M = Ni, Zn, Mn) nanocomposites with different M_xO_y content (0.2, 1 and 3 mmol/g) were synthesized using deposition method and characterized using nitrogen adsorption–desorption, X-ray diffraction, FTIR spectroscopy, TEM, and photon correlation spectroscopy. Heats of immersion in water (Q_w) and *n*-decane (Q_d) were measured using microcalorimetry method, and the corresponding values of the hydrophilicity index $K_h=Q_w/Q_d$ were calculated.

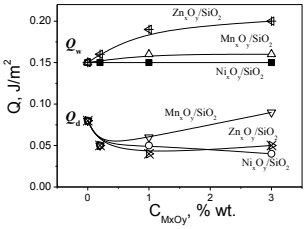

Fig. 1. Q_w and Q_d vs. C_{MxOy}.

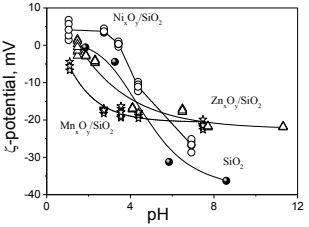

Fig. 2. ζ–potential vs. pH.

Formation of M_xO_y at a silica surface leads to diminishing Q_w and Q_d calculated per 1 g due to specific surface area decreasing, but Q_w calculated per 1 m^2 increases for Zn_xO_y/SiO_2 and Mn_xO_y/SiO_2 in comparison with that of the initial silica. It remained unchanged for Ni_xO_y/SiO_2 (Fig. 1). Modification of the silica surface with M_xO_y significantly changes the pH dependence of zeta potential (Fig. 2) and affects the surface charge density (σ). Shift of the isoelectric point (pH_{IEP}) and a character of the ζ(pH) curve are determined by the M_xO_y phase, and pH_{IEP} shifts toward higher values in a row Mn < Zn < Ni.

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