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About the Structure of the Electrical Double Layer at Oil/Colloidal Suspension Interface.

A. Tikhonov (Univ. of Chicago).

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Introduction: The structure of the insulator/electrolyte solution interface has a fundamental importance for the description of electrochemical processes in systems where membranes, absorbers, catalysts, surfactants or surfaces of other dielectrics are involved [1].

Methods and Materials: I have measured the density of colloidal particles in the low-density region of the electrical double layer at oil/silica colloid interface by means of the grazing incidence diffraction. Figure shows the normalized by a transmission beam 2θ-scan taken at incident angle α=0.045 deg. At this angle (α=0.8αc, αc=0.06 deg is the critical angle) the penetration length for x-rays is approximately 50 Angstrom and the grazing beam is diffracted mostly by the upper part of the interfacial structure.

Results: The scan was measured with the horizontal angular acceptance of the detector (in θ direction) 0.05 deg and with the vertical angular acceptance 7 deg. The transmission beam trough hexane was obtained with the same resolution as the reflected beam. Represented by dashed lines the sequence of Gaussian peaks with the period 0.14 deg (the particle-particle distance is 160 Angstrom) fits the small-angle scattering background well.

Conclusions: Comparison with the bulk small-angle scattering data gives larger value for the particle-particle distance near the hexane/suspension interface and corresponds to the surface concentration of silica particles at least two times less than in the bulk. The particle-particle distance in the bulk of the suspension is 120 Angstrom, which was established from the small-angle scattering background of bulk samples prepared in 0.5-mm diameter glass tubes.

References: A.G. Volkov, D.W. Dreamer, D.L. Tanelli, and V.S. Markin, “Progress in Surface Science”, **53**, 1 (1996)