

Abstract Submitted  
for the MAR07 Meeting of  
The American Physical Society

**Ion-size effect at the surface of silica hydrosol** ALEKSEY TIKHONOV, Center for Advanced Radiation Sources at the University of Chicago, and Brookhaven National Laboratory, NSLS, Beamline X19C — The forces of electrical imaging strongly polarize the surface of colloidal silica. I used X-ray scattering to study the ion-size effect in the adsorbed 2-nm-thick compact layer of alkali ions at the surface of concentrated solutions of 5-nm, 7-nm, and 22-nm particles, stabilized either by NaOH or a mixture of NaOH and CsOH, with the total bulk concentration of alkali ions ranging from 0.1- to 0.7-mol/L. The observed structure of the compact layer is almost independent of the size of the particles and concentration of alkali base in the sol; it can be described by a two-layer model, i.e., a  $\sim 6$  - 8-Angstrom-thick layer of directly adsorbed hydrated alkali ions with a surface concentration  $\sim 3 \times 10^{18} \text{ m}^{-2}$ , and a  $\sim 13$ -Angstrom-thick layer with a surface concentration of sodium ions  $\sim 8 \times 10^{18} \text{ m}^{-2}$ . In cesium-enriched sols,  $\text{Cs}^+$  ions preferentially adsorb in the first layer replacing  $\text{Na}^+$ ; their density in the second layer does not depend on the presence of cesium in the sol. The difference in the adsorption of  $\text{Cs}^+$  and  $\text{Na}^+$  ions can be explained by the ion-size-dependent term in the electrostatic Gibbs energy equation derived earlier by others. Brookhaven National Laboratory is supported by U.S.D.O.E., Contract No. DEAC0298CH10886. X19C is partially supported through funding from the ChemMatCARS National Synchrotron Resource and the University of Chicago.

Aleksey Tikhonov  
Center for Advanced Radiation Sources at the University of Chicago

Date submitted: 20 Nov 2006

Electronic form version 1.4