Instability of SiO_2 Colloids and Sorption of Ca^{2+} Ions

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Abstract: SiO_2 sols were made unstable by addition of Ca^{2+} ions. The resulting states of instability were classified as gelation, flocculation, and precipitation by means of observation, by checking the Tyndall effects on the supernatant or suspending solution, as appropriate, and by measuring the apparent densities of flocculated mass. The concentrations of free Ca^{2+} ions left in solution were measured by means of a Ca^{2+} ion selective electrode. The amounts sorbed onto SiO_2 particles were then calculated by material balance. It was found that while the amount sorbed dictates the limit of stability, the SiO_2 concentration in the mixture is an important factor deciding the state of instability. Depending on the SiO_2 concentration, there were two distinct flocs with the apparent floc density of 6 ± 1 and 12 ± 1 mg SiO_2/ml.

Key Words: Ca^{2+} induced instability • Ca^{2+} sorption • Flocculation • Gelation • Precipitation • Silica colloids • Two distinct flocculates

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