

The Effects of Surfactants on Colloidal, Nanoparticulate, and Dissolved Sulfur

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Elemental sulfur is generally insoluble in water unless in the presence of a surfactant. This phenomenon was investigated by Steudel and Holdt in 1988 by filtering mixtures of sulfur, water, and surfactants through a 0.45 micron filter; however, since then sulfur nanoparticles smaller than 0.45 microns have been detected. The smaller than expected particle size suggests that the distribution of elemental sulfur in water with surfactants may be partitioned into colloidal, nanoparticulate, and truly dissolved components. Experiments have been conducted measuring the sulfur solubility in water with several chemical surfactants and varying filter sizes smaller than 0.45 microns. These experiments were conducted under equilibrium conditions with the solubility being measured using HPLC and square wave voltammetry. Kinetic studies detailing the solubility of sulfur with the surfactants over time have also been investigated. Data regarding the size and occurrence of sulfur nanoparticles present in water and the surfactants has been collected as well to give a complete description of the system under examination. Sulfur isotope fractionation of the dissolved sulfur species is also an interesting component of the system that is currently being investigated using stable isotope ratio mass spectrometry of ³⁴S.