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Applicability of the Gibbs Adsorption Isotherm to the analysis of experimental surface-tension data for ionic and nonionic surfactants

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Abstract

The Gibbs Adsorption Isotherm equation is a two-dimensional analogous of the Gibbs-Duhem equation, and it is one of the cornerstones of interface science. It is also widely used to estimate the surface excess concentration (SEC) for surfactants and other compounds in aqueous solution, from surface tension measurements. However, in recent publications some authors have cast doubt on this method. In the present work, we review some of the best available surface tension experimental data, and compare estimations of the SEC, using the Gibbs isotherm method (GIM), to direct measurements reported in the literature. This is done for both nonionic and ionic surfactants, with and without added salt. Our review leads to the conclusion that the GIM has a very solid agreement with experiments, and that it does estimate accurately the SEC for surfactant concentrations smaller than the critical micellar concentration (CMC).

Keywords: Gibbs adsorption isotherm, Surface tension, Surface excess concentration, Ionic surfactants, Nonionic Surfactants

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