A New Method to Derive Critical Micellar Concentration (cmc) from Surface Tension Experimental Data

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A method to derive critical micellar concentration values (cmc) from surface tension as a function of surfactant concentration experimental data at a given temperature, for systems formed by aqueous solutions of surfactants is presented. Cmc values are obtained by generating a pseudo "excess" surface tension function for which, an "ideal" surface tension as a function of surfactant concentration behavior is included. This, corresponds to a linear function obtained by considering the first experimental data (most of the time, the surface tension of pure water) and the data at the higher surfactant concentration. The "excess" surface tension function is constructed by subtracting the "ideal" surface tension at a given concentration to each experimental surface tension data along the concentration range covered. The corresponding "excess" surface tension function as a function of surfactant concentration almost always shows a well-defined global minimum which is considered to correspond to the cmc, and correspondingly, its surface tension value. To define the coordinates (surface tension and concentration) of the cmc, an analytical function to represent the "excess" surface tension as a function of surfactant concentration is constructed. In most of the cases, a polynomial function is used, from which, its first derivative equated to zero allows the definition of the coordinates mentioned. Now it is possible to obtain the cmc analytically as an ¡¡extreme point!!!, avoiding the a priori elimination of experimental surface tension as a function of surfactant concentration points that is normally done using the traditional method which considers the cmc coordinates as the intersection of two lines representing the behavior shown by this property, the rapid decay and the almost constant surface tension zones. Results for different systems compared to literature will be shown, for aqueous solutions of different surfactants.