Dynamic Surface Tension of Aqueous Solution of Alkanolamines and Surfactants

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We have determined the dynamic surface tension of aqueous solutions of diethanolamine (DEA) and N-methyldiethanolamine (MDEA), at 313.15, 323.15, 333.15, and 343.15 K, at five different concentrations of the alkanolamines. Also, the dynamic surface tension was measured for aqueous solutions of nonionic surfactants: polyoxyethylene(2) oleyl ether (brij 92), polyoxyethylene(20) sorbitan monooleate (tween 80), 2,4,7,9-tetramethyl-5-decyne-4,7-diol ethoxylate(30) (surfynol 485), and 2,5,8,11-tetramethyldodeca-6-yne-5,8-diol (surfynol DF110-D), at 2.15×10^{-4} mol dm^{-3} of surfactant, at two different temperatures (313.15 and 323.15) K. The dynamic surface tension results were obtained employing the pendant drop method, in a range time of (0 to 500) s for the alkanolamines, (0 to 1000) s for brij 92, and (0 to 200) s for the other surfactants. Using the Ward and Tordai model diffusion coefficients were derived for the four surfactants. Also, the foam height for the four aqueous surfactants was measured employing an all-glass apparatus based on the recirculation method, at the same temperatures than those considered in the dynamic surface tension study in the range time of (0 to 5000) s. The foam height is larger for the aqueous solutions of surfynol 485 than those for the systems with tween 80, surfynol DF110-D, and brij 92, which is highly consistent with the behavior of the equilibrium surface tension for these systems. The derived values of the diffusion coefficient for four aqueous solutions of surfactants lead to the conclusion that mass transport towards the interface is controlled by bulk diffusion. These values help to understand the foaming behaviour of the surfactant solutions.