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A THERMODYNAMIC STUDY OF SELF-ASSOCIATION IN β-CASEIN AND BRIJ 35 SOLUTIONS

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ABSTRACT

The self-association of both β-casein A^1 and Brij 35 in aqueous solution has been studied at several temperatures using the techniques of microcalorimetry, sedimentation equilibrium, sedimentation velocity, pycnometry and surface tension measurements. Attempts to obtain the equilibrium concentration of the various β-casein species in solution by ultracentrifugation have been unsuccessful owing to both degradation and the rate of equilibration. The equilibrium concentrations for β-casein were estimated from published fluorescence data.

The results have been analysed by treating each self-association process as being one of micelle formation. For both systems the standard free energy of micelle formation was negative whereas the corresponding standard enthalpy and entropy changes were positive. The temperature trends in the various thermodynamic parameters were inconclusive owing to experimental uncertainty.

The significance of the values of the thermodynamic parameters is discussed qualitatively. The driving force behind the self-association process for both systems appears to be the positive entropy change associated with the hydrophobic effect. A comparison is made between the two systems and it is concluded that β-casein self-association is similar in several respects to micelle formation in solutions of synthetic detergents.

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