

Interaction between poly (ethyleneglycol) and dioctadecyldimethylammonium and diododecyldimethylammonium bromide in aqueous solution

Santos CCM. **Interação de poli(etileno glicol) com brometo de dioctadecildimetilamônio e didodecildimetilamônio em dispersões aquosas.** São José do Rio Preto – SP, 2006. [Tese de Doutorado – Área: Biofísica Molecular – Instituto de Biociências, Letras e Ciências Exatas – Universidade Estadual Paulista] Orientador: Dr. Eloi da Silva Feitosa

Poly (ethyleneglycol) (PEG) is a water soluble neutral polymer, and dioctadecyldimethylammonium (DODAB) and diododecyldimethylammonium (DDAB) bromide are double chain cationic surfactants derived from the quaternary ammonium that have been widely investigated due to their high application potential in different areas of the science and technology. The physical properties of PEG, DODAB and DDAB in aqueous solution are well-known. However, the properties of mixtures of the polymer with those surfactants are not. We investigated the interaction of PEG with DODAB and DDAB in aqueous solution, within a range of total concentration of the components of 0-1 wt%, and the phase diagrams built up, with special interest for the vesicular phases. We used PEG with molecular mass between 200Da and 2 MDa and the phase diagrams were built up at 25°C, that is, above the melting temperature (T_m) of DDAB ($T_m = 16^\circ\text{C}$) and below T_m of DODAB ($T_m = 45^\circ\text{C}$). DODAB and DDAB have the common characteristic of forming unilamellar vesicles at low surfactant concentrations and multilamellar vesicles at higher concentrations; at intermediate concentrations, uni- and multilamellar vesicles coexist in solution. The borders of these different vesicle phases are not well defined. We observed in this Thesis that the effect of PEG on the structures of DODAB and DDAB aggregates in water depends on the molecular mass of the polymer. Besides, PEG stabilizes the unilamellar vesicles at high concentrations of DODAB, where the multilamellar vesicles are the dominant structures present in solution, thus allowing the formation of mixed DODAB/PEG and DDAB/PEG vesicles in water at relatively high concentrations of these surfactants. The experimental methods used in this investigation include turbidimetry, steady-state fluorescence, differential scanning calorimetry (DSC), isothermal titration calorimetry (ITC), and visual analysis by crossed polaroids. It was also performed bactericidal activity tests for reference microorganisms of 1 mM DODAB in sonicated and non-sonicated aqueous dispersions, in the presence and absence of PEG_{200Da} and PEG_{2MDa}. The effect was made using the method of the cart road cylinders. It revealed no bactericidal activity in the pure form within 10 minutes (or longer time) of contact, meaning that DODAB or DODAB/PEG is not efficient as bactericidal agent for hospitable use.

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