

ABSTRACT

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TITLE: Studies on Surfactant-Polymer Interaction in Presence of Different Additives

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The study of polymer-surfactant interactions is important in the field of industrial, domestic, and technological processes, such as paints, the food industry, medicinal, and drug delivery systems. To achieve detailed knowledge to develop formulations for practical uses, various types of surfactants (cationic, anionic, nonionic, or gemini types, etc.), as well as polymers, may be used.

(i) Hydroxyethyl cellulose (HEC) is widely used in pharmaceuticals, wastewater treatment, drug delivery, and coatings. Sodium N-dodecanoyl sarcosinate (SDDS), with high biodegradability, biocompatibility, and low toxicity, is regarded as a sustainable "green" surfactant.

(ii) 2,2,2-Trifluoroethanol (TFE), highly miscible with water, is an effective cosolvent in biological research and organic synthesis. Hydrophobic interactions between HEC and SDDS are observed, with TFE enhancing the hydrophobic environment and lowering the CMC of SDDS.

(iii) Pectin has been chosen due to its bioavailability, affordability, and widespread use in the food and pharmaceutical industries. The alkyl triphenylphosphonium bromides, a novel class of cationic surfactants, are emerging as promising alternatives to ammonium-based surfactants.

(iv) The interaction between the polyanion pectin and cationic alkyl trimethylammonium bromide (C_n TAB) surfactants examines how polymer charge density and surfactant hydrophobicity (alkyl tail lengths $n = 12, 14, 16, 18$) influence their complexation behaviour.

(v) The study of interaction between sodium hyaluronate (HA), an anionic polyelectrolyte, and 1-hexadecyl-3-methyl imidazolium chloride (C_{16} MImCl), a surface-active ionic liquid, focuses on the resulting PE-SAIL colloidal complex and its interfacial properties, mobility, coacervation, size, and morphology.

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