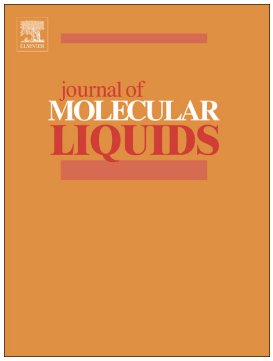

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Synthesis, surface activity and thermodynamic properties of cationic gemini surfactants with diester and rigid spacers

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Abstract A group of cationic gemini surfactants with diester and rigid spacers, 12-Ph-12, 14-Ph-14, 16-Ph-16, were synthesized and confirmed by IR, ^{1}H NMR and elemental analysis. The surface parameters of the synthesized gemini surfactants including: the critical micelle concentration (CMC), the surface tension value at CMC (γ_{CMC}), effectiveness (π_{CMC}), efficiency (pC_{20}), maximum surface excess (Γ_{max}) and minimum surface area (A_{min}), were obtained from surface tension measurements. These gemini surfactants showed higher surface activity than the traditional monomeric surfactants. The thermodynamic parameters of micellization process from conductivity measurements showed that the micellization was a spontaneous and exothermic process in environment, and the micellization process becomes less favorable with the decrease of alkyl chain length and increase in temperature. The micropolarity was evaluated from steady fluorescence spectra, and the dye solubilization was investigated by using UV-visible spectroscopy. The results revealed that the micropolarity of surfactant micelles is very low and these gemini surfactants can really enhance the solubility of water insoluble dyes.

Keywords Gemini surfactants, Diester and rigid spacers, Surface activity properties, Thermodynamic parameters, Dye solubilization

1. Introduction

Gemini surfactants represent a novel class of surfactants, which are made up of two conventional monomeric surfactant units linked by a flexible or rigid spacer at or very close to the head groups. It has been found that gemini surfactants can exhibit superior solution properties compared to the corresponding single-chained surfactants in many aspects, such as lower critical micelle concentration (CMC), more efficient in lowering the surface tension of water, better emulsifying properties and unusual aggregation morphologies [1-5]. Owing to their unique performance, the use of gemini surfactants covers the substantial homogeneous catalytic reactions along with solubilisation, emulsification, and many more technical applications in industries such as industrial detergency, gene transfection, micellar catalysis and corrosion inhibitors [6-9].

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