



Synthesis and evaluation of Gemini cationic surfactant based on 4-(4-nitrobenzyl)pyridine: surface and biological activities

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Received 27 April 2022; Accepted 10 September 2022

ABSTRACT

Gemini cationic surfactants were prepared via alkylation of 4-(4-nitrobenzyl)pyridine in acetone in one step with 1,10-dibromodecane, 1,8-dibromooctane, and 1,6-dibromohexane. The chemical structure of prepared Gemini cationic surfactants were confirmed by using ¹H NMR and Fourier-transform infrared spectroscopy. At 25°C and 40°C, surface tension was estimated, in addition surface properties such as critical micelle concentration, effectiveness (π_{CMC}), minimum surface area (A_{min}), efficiency ($P_{C_{20}}$) and maximum surface excess (Γ_{max}). The results of the thermodynamic parameters of adsorption and micellization were evaluated and revealed that both processes are spontaneous. It is clear that the prepared Gemini surfactants have a high proclivity for adsorption at surfaces and micellization in the majority of their solutions. The prepared surfactants' antibacterial efficacy against gram-negative, gram-positive, and fungi was studied. In this study, new compounds with anti-bacterial and anti-fungal properties were prepared, and their properties were improved by lengthening the carbon chain. By increasing the hydrophobicity and spacer carbon length of the Gemini surfactants, the antibacterial specialized features of these compounds were increased.

Keywords: Gemini surfactants; Surface properties; Antimicrobial activities

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