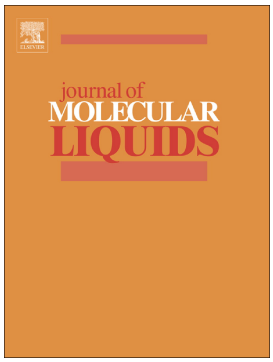

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The kinetics and effect of a new gemini surfactant on the efficiency of micellar catalysis for the hydrolysis reaction of 4-nitrophenyl acetate

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Abstract

A new cationic gemini surfactant containing amide bond (**C12-4-C12**) was synthesized through a simple two-step procedure, and its chemical structure was confirmed by IR, ^{1}H NMR spectroscopy and element analysis. The physical and chemical properties of the gemini surfactant in aqueous solution were investigated by surface tension and conductivity. The results show that the gemini surfactant possess good surface properties. The effect on the hydrolysis reaction rate constant (*K*) of 4-nitrophenyl acetate (**PNPA**) and the kinetics of the hydrolysis reaction with the gemini surfactant (**C12-4-C12**) was studied by means of spectrophotometry. The experimental results showed that the efficiency of micellar catalysis by gemini surfactant **C12-4-C12** was significantly higher than that of the traditional single-chained surfactant CTAB. The possible liquid-liquid biphasic micellar catalyzed model was presented, which might be beneficial for the further study of the mechanism of liquid-liquid biphasic reaction.

Keywords Gemini surfactant, Surface properties, Micellar catalysis, Kinetics

1 Introduction

Gemini surfactants represent a novel type of surfactants. Gemini surfactants are made up of two hydrophobic chains and two polar head groups covalently linked by a spacer at the level of the head groups or very close to these groups. They have been proven to possess unique properties [1-5], such as lower critical micelle concentration (CMC) and Kraft temperature, greater efficiency in lowering the surface tension, unusual aggregation behavior and better solubilization in comparison to conventional surfactants, which is due to the great difference of molecular structures between gemini surfactants and conventional surfactants. Gemini surfactants have wide applications in metal inhibitors [6,7], micellar catalysis [8-10], and the preparation of advance material [11,12]. Due to their various properties, gemini surfactants need detailed and intensive attention for both fundamental understanding and application prospects.

Recently, a large number of studies have focused on the micellar catalysis due to the gently and effective reaction condition, and high selectivity [13-17]. When the concentration of surfactant above the value of cmc, the formation of micelles can solubilize the reactant from the oil to water phase, resulting in greatly increased the exposure probability of reactants in two

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