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Effect of anionic biocompatible amino acid surfactant and sodium dodecyl sulfate on the rate of alkaline hydrolysis of *tris*(2,2′-bipyridine)iron(II) complex: A comparative study

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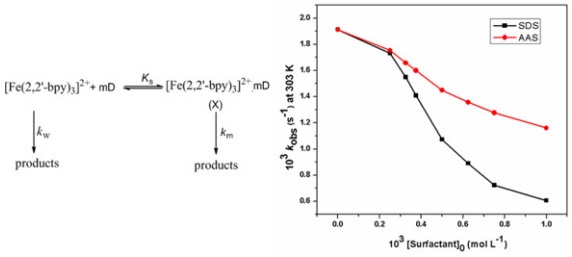
HIGHLIGHTS

- Alkaline hydrolysis of *tris*(2,2′-bipyridine)iron(II) complex in presence of anionic amino acid surfactant and SDS.
- Inhibitory effect of SDS on rate is more pronounced than amino acid surfactant.
- Kinetic data fit nicely to theoretical equations.
- Temperature effect on the binding constant is negative due to exothermic nature of surfactant–substrate binding.

GRAPHICAL ABSTRACT



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ABSTRACT

Sodium-*N*-dodecanoylphenylalaninate, an anionic amino acid surfactant (AAS) has been synthesized and characterized by spectroscopy and tensiometry. The kinetics of alkaline hydrolysis of *tris*(2,2′-bipyridine)iron(II) complex has been studied in presence of AAS and SDS in the temperature range of 303–318 K. Both the surfactants have an inhibitory effect on the rate, particularly below the CMC of the surfactants. The inhibitory effect of the surfactants has been accounted for by the association/binding of the surfactant molecule with the substrate. The activation parameters and the binding constants at different temperatures were determined from the temperature effect. The results in terms of different transition points, binding of the substrate-bound surfactant aggregates & free micelles, the standard enthalpy & entropy of activation, binding constants & interaction of both surfactants, and so forth have been explained. The results have been rationalized in terms of an interaction model.

1. Introduction

Surfactants are amphiphilic compounds, characterized by hydrophobic and hydrophilic domains with measurable aqueous solubility of both aggregates and as monomers. These surface active agents are consumed in large quantities everyday on a wide-reaching scale. Since it can adversely affect the aquatic environment, the biodegradability and biocompatibility are almost as important as their functional performances to the consumer. Thus there is a pressing need for producing biodegradable and biocompatible surfactants. These can be produced from molecules that mimic natural amphiphilic structures [1–7]. Amino acids are frequently used for this purpose as soon as they were discovered. A polar amino acid with a hydrophobic fatty acid chain together can combine for building up the amphiphilic structures with high

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