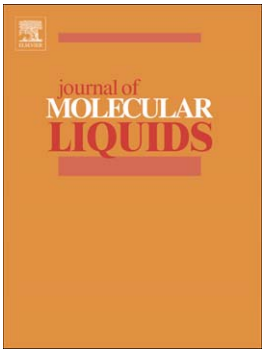

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Effect of anionic surfactants on the surface plasmon resonance band of silver nanoparticles: determination of critical micelle concentration

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Abstract

We have utilized surface plasmon resonance (SPR) band sensitivity to surfactant concentration to investigate the critical micelle concentration (cmc) of AOT and SDS. The process is based on an in situ formation of silver nanoparticles (AgNPs) through the reduction of silver ions (Ag^{+}) by diethylene triamine (DETA) at room temperature. The shift of the SPR band position (λ_{max}) at cmc can be observed with the naked eye in the form of a color change from brown to red for SDS and from brown to yellow for AOT.

Keywords: Silver nanoparticles; Anionic surfactants; Critical micelle concentration**.**

1. Introduction

Surfactant is a unique group of compounds containing both a hydrophobic long-chain and a hydrophilic polar head group in their structures [1, 2]. In complex systems, surfactants were widely used in membrane protein separation, crystallization, purification and stabilization. Since the physicochemical properties of solutions below and above cmc demonstrate drastic changes, such as surface tension, electrical conductivity, turbidity, osmotic pressure, density, viscosity, and light scattering [3]. Many methods have been proposed to determine the cmc of surfactants, e.g. spectrophotometry [4], colorimetric [5], potentiometry, refractometry, conductometry, capillary electrophoresis, light scattering [6], pyrene 1:3 ratio method [7], and so forth. Metal nanomaterials such as silver nanoparticles (AgNPs) and Au nanoparticles (AuNPs) have been found wide applications as ideal probes for colorimetric detection owing to their unique optical and electric properties [7–10]. When gold/silver ions are reduced to AuNPs/AgNPs, solutions show a distinctive color attributed to differences in their size and concentration. Besides, surface plasmon resonance bands of noble