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DETERMINATION OF CRITICAL MICELLAR CONCENTRATION OF SDS BY LOCALIZED SURFACE PLASMON RESONANCE OF GOLD NANOPARTICLES AND THE TYNDALL EFFECT

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Abstract

Investigation of the determination of the critical micellar concentration (CMC) of sodium dodecyl sulfate (SDS) in water by means of electrical conductivity and plasmon resonance (PR) of gold nanoparticles (NPAu) immersed in the solution.

Introduction

The CMC determines the concentration of molecules, above which they aggregate to form organized structures, called micelles, and below which a homogeneous solution of amphiphilic molecules is obtained. The two conditions are characterized by different physicochemical and optical properties, which can be exploited for the precise determination of the CMC value. In this work we used the electrical conductivity for determination of CMC, a technique known to be suitable for this determination, a way to validate the results obtained with the determination of the wavelength in the PR of NPAu immersed in the solution. The wavelength in resonance depends on the dielectric constant of the medium around the particles.

Materials and Methods

- 12 glass tubes; Sodium dodecyl sulfate; Ultrapure water; Gold nanoparticles.

It was made 12 samples of SDS solution, based on 1mM to 12mM, with ultrapure water (6.35mL) and gold nanoparticles (0.65mL), to be analyzed by spectra techniques of UV-Vis, for determination of PR.

It was also made 12 samples of SDS solution with ultrapure water (10mL) to be analyzed by a conductivity meter.

Results and Discussion

Measurements were made to be studied through the Tyndall effect, but a good result was not obtained because it did not have an expected sensitivity of the equipment.

The graph below shows the wavelength variation in PR (nm) and electrical conductivity (μs/cm) as a function of SDS concentration, measured in mM. In the graph can be observed the change in values and trends as a function of the concentration that takes place for a concentration in approximately 5mM.

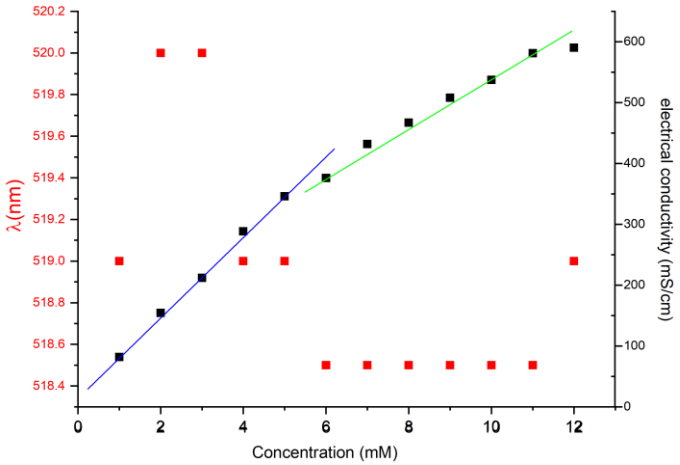


Figure 1. Graph of the overlap of the electrical conductivity and wavelength graphs of the samples.

Conclusion

As the variation in the peak trend of plasmon resonance through UV-Vis happens at the same concentration as that of electrical conductivity (between 5mM and 6mM), a conclusion is reached that it is feasible to determine the concentration of CMC through resonance.

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