A thorough spectroscopic study about the interaction of surfactants with carboxylated single-walled carbon nanotubes

Manuel López-López[1], Eva Bernal[2], María Luisa Moyá[2], Pilar López-Cornejo[2]

[1]Department of Chemical Engineering, Physical Chemistry and Material Science. Faculty of Experimental Sciences. University of Huelva. Avda. Tres de Marzo s/n. Campus El Carmen. 21071 Huelva (Spain).
[2]Department of Physical Chemistry. Faculty of Chemistry. University of Sevilla. c/ Profesor García González s/n. 41012 Sevilla (Spain)

manuel.lopez@diq.uhu.es

Abstract

Carbon nanotubes (CNT) are currently one of the most interesting nanomaterials due to their remarkable mechanical, optical and electrical properties. They have a wide range of applications as sensors [1], electronic components [2], etc. For many applications a uniform and stable dispersion is needed. Surfactants (cationic, anionic and nonionic) have been shown to be efficient CNT dispersing agents [3]. Most works in the literature are aimed at the study of the properties and stability of CNT-surfactant systems, establishing criteria for designing optimal dispersion [3].

In this work a through study of the SWCNTCOOH aqueous dispersions in the presence of several surfactants was carried out. Different techniques were used in order to gain precise information about the interactions operating in these SWCNTCOOH-surfactant systems. Results indicate that the interaction of the surfactants with SWCNTCOOH depends on the surfactant charge as well as on the surfactant hydrocarbon tail length, as is shown by the surfactant adsorption at the CNT surface (Figure 1). The negatively charged CNT used in this work attracts (repels) the cationic (anionic) surfactants. On the other hand, the hydrocarbon tail length plays an important role in the CNT-surfactant interactions due to the self-organization of surfactants on the CNT surface. Both surfactant monomers and micelles influence the physicochemical properties of the CNT aqueous dispersions.

References

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Figures

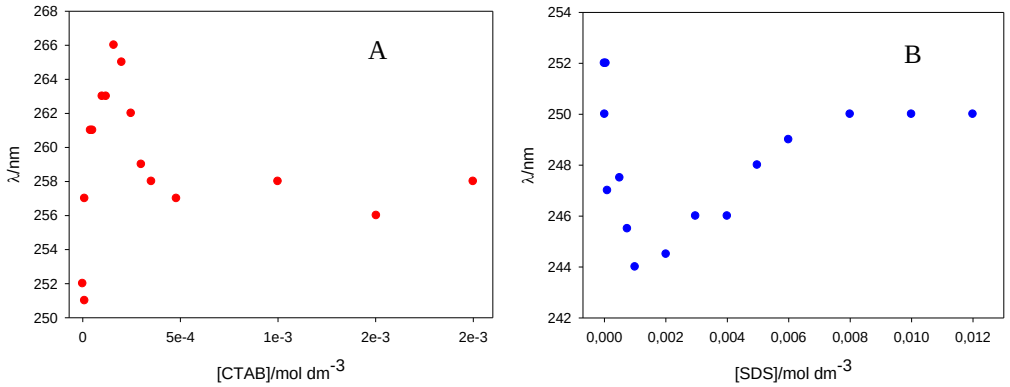

Figure 1.- Influence of CTAB (A) and SDS (B) concentration on the UV-vis spectra of SWCNTCOOH dispersions.