

ELECTROCHEMICAL AND SENSING RESPONSE OF LB FILMS OF A COPPER IONOPHORE

Joan Torrent-Burgués^{1,2}, Ester Gaus¹, I.A. Marques de Oliveira², M. Pla², A. Errachid²

1) Dep. Ingeniería Química, UPC, C/ Colom 1, 08222-Terrassa, Spain

2) CBEN, CREBEC, PCB, C/ Josep Samitier 1-5, 08028-Barcelona, Spain

juan.torrent@upc.edu

Langmuir-Blodgett (LB) films are nanometric systems with potential applications in sensors, optical and electronic devices. The new synthesized thiomacrocyclic 4-phenyl-4-sulfide-11-(1-oxodecyl)-1,7-dithia-11-aza-4-phosphacyclotetradecane works as a copper ionophore as it has been tested in polymeric membrane ISE [1,2]. This compound forms Langmuir and LB films, which characteristics have been studied previously [3]. Nanostructures such as LB films are attracting considerable interest for realizing specific recognition and for efficiently detecting analytes. In this work we show the electrochemical behavior of LB and LS (Langmuir-Schaefer) films of the thiomacrocyclic ionophore and the sensing response to copper ions, using several techniques.

The analytical response has been tested in a capacitive device, which is achieved by LB films deposited on silicon nitride. Surface characterization of these LB films has been also performed by AFM and XPS. The impedance response of the capacitive device has been done using copper(II) ion solutions with different concentrations from 10^{-7} to 10^{-2} M. The shift of the admittance curves owing to the variation of the Cu(II) ion concentration shows that the device is sensitive to this ion (Figure 1) [4].

The electrochemical response of a LB film of the thiomacrocyclic bound to copper ions has been performed extracting the LB film from a copper(II) ion subphase and using cyclic voltammetry. The electrode was a carbon vitreous sheet. The voltammogram shows a peak at a potential that differs from that corresponding to adsorbed Cu(II) ions and that is associated to the complex Cu(II)-thiomacrocyclic (Figure 2). On the other hand, it has also been obtained the voltammetric response to copper ions in solution of a LB or LS film of the thiomacrocyclic extracted from water subphase. A noticeable effect on the copper redox process appears in respect to that occurring on the electrode without film.

References:

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Figures:

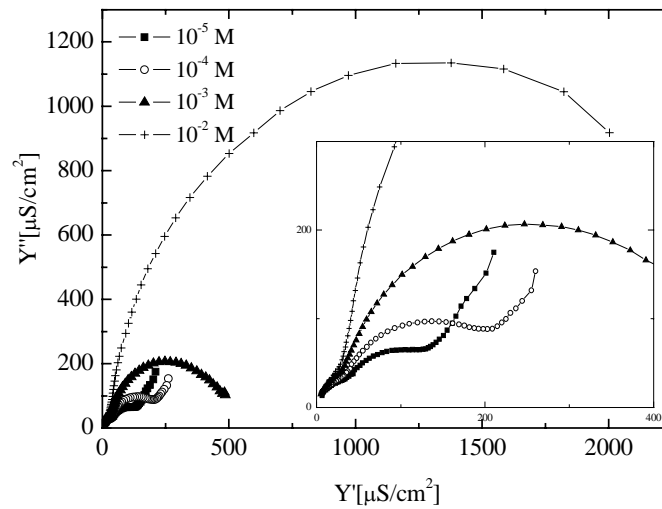


Figure 1. Complex plane admittance plot for different Cu(II) ion concentrations

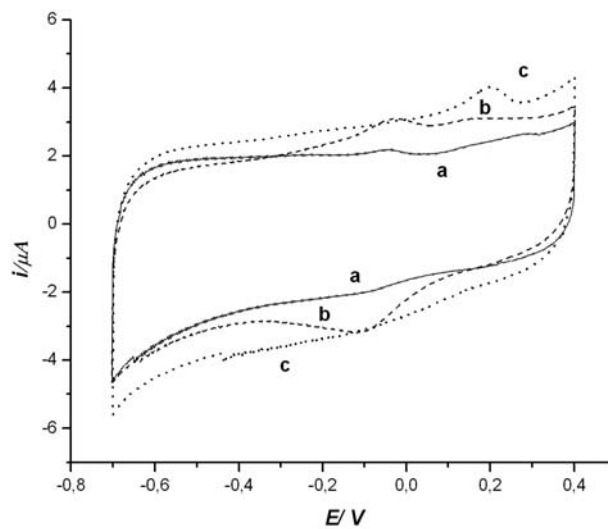


Figure 2. Cyclic voltammograms for blank (a), adsorbed Cu(II) ions (b) and Cu(II)-ionophore LB (c)