

**ELECTROPOLYMERISED
ARCHITECTURE ENTRAPING A
TRILACUNARY KEGGIN-TYPE
POLYOXOMETALATE FOR
ASSEMBLING A GLUCOSE BIOSENSOR**

G. L. Turdean¹ +, A. Curulli⁺, I. C. Popescu¹,
C. Rosu² and G. Palleschi⁺⁺

¹ Physical Chemistry Department, "Babes-Bolyai" University, 3400 Cluj-Napoca, RO-Romania

⁺Centro CNR di Studio per l'Elettrochimica e la Chimica Fisica delle Interfasi, Via del Castro Laurenziano 7, 00161 Roma, Italy.

² Inorganic Chemistry Department, "Babes-Bolyai" University, 3400 Cluj-Napoca, RO-Romania

⁺⁺Dipartimento di Scienze e Tecnologie Chimiche, Università di Roma "Tor Vergata", Via della Ricerca Scientifica - 00133 Roma, Italy.

The catalytic redox activity of polyoxometalates has attracted much attention in recent years [1]. Heteropolyanions and especially their metal-substituted derivatives have some very useful and interesting properties. Such features include the high stability of most of their redox states, the possibility to tune their redox potential by changing the heteroions and/or the addends ions without affecting their structure, the variability of the transition metal cations which can be incorporated into the heteropolymetalates structure, and the possibility of multiple electron transfer. These properties make heteropolyanions attractive as redox catalysts (mediator) for indirect electrochemical processes.

The polyoxometalates can be attached onto the electrode by using an interaction between the polyoxometalates and the electrodic surface. There are three methods commonly used to immobilise them [1]. The first method is the adsorption of polyoxometalate on the electrodes by dip coating. The second is the electrodeposition of polyoxometalates on the electrode surface from a polyoxometalate solution under constant potential. The third method is to entrap polyoxometalates into polymers onto the electrode. This entrapment can be carried out in a stable way by two ways. First, electrostatic incorporation into a polymer can be considered, performed on the electrode (two step method), for example by spin coating or electropolymerisation. Then the polymer-

coated electrodes are soaked in the solution containing the electrocatalysts.

Second, polyoxometalates are immobilised simultaneously with the electropolymerisation procedure (one step method), in other words the oxidative polymerisation is carried out in the presence of the polyoxometalates.

The last method seems to be very promising and it is a simple way to assemble modified electrode and/or sensors

Few investigations on the electrochemical behaviour of Fe₄-POM free or immobilised have been reported, as well of its electrocatalytic activity vs. H₂O₂, and no data have been published about its use in assembling biosensors.

In this paper, we reported a study of the electrochemical and electrocatalytic behaviour of Fe₄-POM immobilised in an electropolymer such as poly(1,8-DAN) [2], on graphite electrodes. We studied the stability of Fe₄-POM [3] immobilised, changing the electropolymerisation conditions.

For the first time, to our knowledge, a glucose biosensor, assembled immobilising glucose oxidase (GOx) and Fe₄-POM in an electropolimerised film, has been obtained. A study of immobilising system for GOx and the catalysts has been carried out. In this way, we could detect H₂O₂ amperometrically at an applied potential of -0.04V vs. Ag|AgCl. Finally, the resulting glucose biosensor has been fully characterised in terms of detection limit, linear range, response time and stability [4].

[1] M. Sadakane and E. Steckhan, *Chem Rev.*, **98**, (1998), 219-237 and references cited therein

[2] K. Jakowska, M. Skompska, E. Przymuska, *J. Electroanal. Chem.*, **418**, (1996) 35-39.

[3] C. Rosu, G. L. Turdean, C-A. Ciocan, I.C. Popescu, *J.Chem.Commun. Dalton Trans.*, (2000), accepted

[4] G. L. Turdean, A. Curulli, I. C. Popescu, C. Rosu, G. Palleschi, *Electrochim Acta*, 2001, sent for publication