Abstract #1488, 223rd ECS Meeting, © 2013 The Electrochemical Society

Highly Sensitive Junction Electrodes with Self-Assembled Regenerated Cellulose Thin Films

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Cellulose is the most common organic polymer which has many applications in traditional analytical chemistry as well as in coatings, pharmaceuticals, foods, and in textiles. Cellulose films have been used to modify and protect electrode surfaces[1] where cellulose nano-whisker films have been deposited by electrostatic layer-by-layer method with suitable binders,[2] by drop-casting[3] or by electrodeposition[4].

In this report spontaneously self-assembled porous cellulose films on tin-doped indium oxide (ITO) electrodes are introduced. The layered cellulose films are formed by self-assembly by immersing the electrodes in the alkaline cellulose solution prepared from wood pulp. The hydrophilic properties of regenerated cellulose films are utilised with a thin-film (ca. 150 nm) coated ITO electrodes “sandwiched” together to form a generator-collector configuration where the electrodes were sealed together with silicone. In the junction electrode the potential applied to the generator is swept and the redox active species is for example reduced which then diffuses to the collector electrode and is oxidised back. The collector electrode is held at fixed potential thereby eliminating charging current and increasing the analytical feedback current.

The schematic of the junction electrode is presented in the Figure 1 where the flow direction of the solution through the junction is shown. The junction with the cellulose layer between the electrodes produced highly sensitive analytical device with sub-micromolar detection of redox active species.

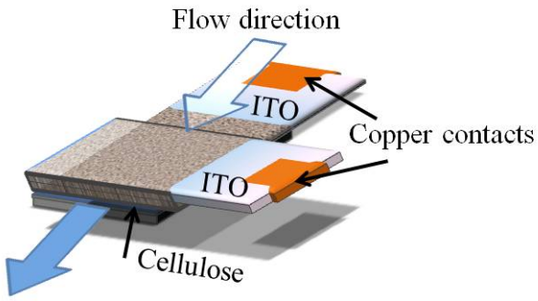

Figure 1. Schematic of the junction electrode with cellulose layer between the two ITO electrodes, showing the direction of the solution flow between the electrodes.

Acknowledgements
A. Vuorema thanks the Academy of Finland for financial support.

Literature

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