Reagentless affinity sensors based on antibodies or DNA co-immobilized with redox polymers

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The field of electrochemical affinity sensors has received considerable attention in the last decade due to the potential to deliver sensitive, cheap and disposable platforms/sensors for the analysis of a broad range of analytes[1]. One of the difficulties faced is that antibody-antigen/hapten complexation or DNA hybridization does not normally produce an adequate electrical signal for detection. This has been overcome, typically, by labelling with an enzyme which catalyses a substrate transformation, producing a compound that may be detected electrochemically.

Recently, attempts have been made to develop sensor formats that do not require labelling of the reagents. Previously developed electrochemical pseudo-reagentless platforms have been based on potentiometric/capacitive[2] and electrochemical impedance spectroscopy[3] methods.

In this presentation we report “proof of concept” results for pseudo-reagentless immunosensor and DNA hybridisation sensors based upon an immobilized redox polymer probe. An electrochemical screen-printed graphite electrode, is modified with an osmium redox polymer and antigen (Rabbit IgG), or single-stranded DNA, then cross-linked to form the sensing surface. The presence of the redox polymer provides information on the immunocomplex formation or DNA hybridization. Voltammetry is used to examine changes in the immobilized film characteristics, due to antibody-antigen binding or DNA hybridization, and a response is obtained that is binding dependant.

The long-term objective of this research is to develop a reproducible affinity sensor platform, based on this template, capable of delivering both qualitative and quantitative data.

References

1. D. Leech, (1994) *Chem. Soc. Reviews*, **23**, 205-213.
2. C. Berggren, G Johansson, (1997) *Anal. Chem.*, **69**, 3651 – 3657.
3. G. Lillie, P. Payne, P. Vadgama, (2001) *Sensors and Actuators B*, **78**, 249-256.