Exploring methods for characterisation and recovery of BDD electrodes affected by biological fouling

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One of the major factors limiting the use of electrochemical sensors for biological studies is the fouling caused by the biological matrix itself. For example, in the gastrointestinal tract fouling is caused by mucin, which is a glycoprotein that is released into the lumen to aid in the passage of food and waste products.[1] Similarly, blood is a complex biological fluid containing large amounts of proteins with potential to cause fouling, such as albumin which regulates the colloidal osmotic pressure of blood[2] and is by far, the most abundant protein in blood.[3] Fouling typically involves the passivation of an electrode by an agent, that forms impermeable or permeable layers on the surface, modifying charge and electron transfer at the electrode/electrolyte interface.[4] Electrode fouling negatively affect the sensitivity, detection limit, reproducibility and reliability of the electrochemical sensor. In particular, *in vivo* or *in situ* measurements expose the sensors to a complex matrix of proteins, which adsorb on the sensing surface.

When developing electrochemical sensors it is important to develop procedures which can (1) aid in determining when the electrode has been fouled such that the returned signal is meaningless, (2) if the electrode has been in-situ cleaned can help prove the surface is back to its original state and (3) where possible prevent fouling in the first place. We explore here the use of double layer capacitance (C_{dl}) measurements on providing information on the clean and fouled state of the electrode and explore different methods of capturing C_{dl} highlighting the advantages/ disadvantages of each.

References:

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