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Graphene paper based bioelectrodes for enzymatic biofuel cells

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We aim at developing bioelectrodes for enzymatic biofuel cells, where sustainable and renewable enzymes are used for catalyzing the oxidation and reduction of fuel molecules. Here glucose is chosen as fuel molecule and glucose oxidase (GOx) is target enzyme which catalyzes the oxidation of glucose. Due to its large surface area, good electronic conductivity and biocompatibility, 3-dimensional graphene paper is used as supporting electrode material to accommodate GOx. In addition, graphene paper is flexible with good mechanic strength and an ideal fit for bioelectrodes.

The graphene paper based GOx electrode is made through formation of graphene oxide, graphene paper and immobilization of GOx on the graphene paper. The prepared bioelectrodes have been measured by electrochemistry and scanning electron microscopy (SEM). Cyclic voltammetry show clearly electrocatalytic signals for oxidation of glucose, Figure 1. This indicates that the enzyme has been successfully immobilized and is actively consuming glucose while transferring electrons to the graphene paper-GOx bioanode. Stability and efficiency of the bioelectrodes are under investigation.

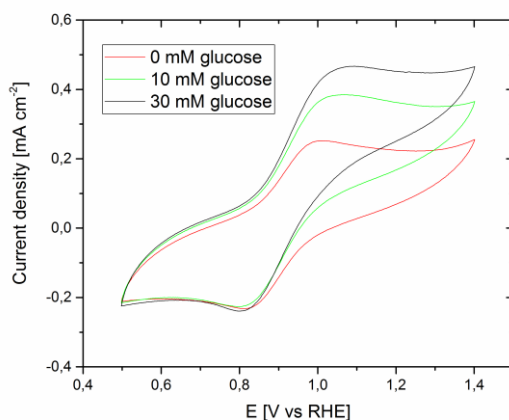


Figure 1. Cyclic voltammetry of graphene paper based GOx electrode in the presence of 10 mM phosphate buffer (pH 7.0), 0.8 mM ferrocene and 0, 5 and 15 mM glucose, scan rate 10 mV s⁻¹.