Immobilized Anthracenyl-modified Pyrenes on Carbon Nanotubes for Improved Oxygen Reduction Reaction by *Trametes Versicolor* Laccase

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*Trametes Versicolor* laccase is a class of enzyme than can catalyze the four electron reduction of $O_2$ to water, making this enzyme an ideal candidate as bioelectrocatalyst at cathodes in enzymatic biofuel cells.

Many strategies are used to immobilize laccase at the cathode [1-4]. However, low current densities are often obtained due to the the random immobilization of the enzyme decreasing the overall performances of the biofuel cell. An elegant approach was the use of anthracene group that can fit in the hydrophobic pocket of laccase in close vicinity to the T1 copper acting as an electron relay to shuttle electron directly from the conductive material to the copper atom [5]. Since then, different techniques have been used to functionalize surfaces with anthracenyl groups on carbon nanotubes (CNTs) [6, 7].

Pyrene, an aromatic molecule based on four fused benzene rings, is known to graft on CNTs via π-π stacking interactions. The presence of this group on CNTs surfaces have been demonstrated to help direct electron transfer of laccase for the oxygen reduction reaction [8].

Here, we report a new strategy to functionalize carbon nanotube (CNT) walls using pyrene groups modified by anthracene groups (Fig. 1). A further modification of the pyrene with an anthracene group show an increase in catalytic current compared to the regular pyrene-based CNTs. Different pyrene moieties are examined in this study. Finally, the resulting electrodes are assembled with different anodes in complete glucose/oxygen biofuel cells and evaluated.

References