

Enzymatic Bioelectrocatalysis for Energy Conversion Applications

Shelley Minteer

Oxidoreductase enzymes have been employed for almost 5 decades for energy conversion in the form of biofuel cells. However, most enzymatic biofuel cells in the literature utilize complex biofuels, but only partially oxidize the complex biofuel via the use of a single enzyme (i.e. glucose oxidase or glucose dehydrogenase). This presentation will detail the use of enzyme cascades at bioanodes for deep to complete oxidation of fuels to improve performance. These enzyme cascade will include natural metabolic pathways (i.e. the Krebs's cycle), as well as minimal metabolic pathways to promote electron flux. It will also compare fuel options for biofuel cells and discuss the importance of structural orientation of enzymes and enzyme complexation in enzymatic cascades for efficient energy conversion. This enzyme cascades inspired us to consider mitochondria as bioelectrocatalysts as well, so direct mitochondrial bioelectrocatalysis will also be discussed.