Highly selective transformation of glycerol to dihydroxyacetone without using oxidants by PtSb/C-catalyzed electrooxidation process

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We demonstrate an electrocatalytic reactor system for the partial oxidation of glycerol in an acid solution to produce value-added chemicals such as dihydroxyacetone (DHA), glyceraldehyde (GAD), glyceric acid (GLA), and glycolic acid (GCA). Under optimized conditions, carbon-supported bimetallic PtSb (PtSb/C) catalyst was identified as the highly active catalyst for the selective oxidation of glycerol in the electrocatalytic reactor. The product selectivity can be strongly accommodated as a function of applied electrode potentials and catalyst surface composition. The main products for the electrocatalytic oxidation of glycerol were DHA, showing a yield of 61.4% of DHA production at a conversion of 90.3% of glycerol, which can be achieved even without using any oxidants over the PtSb/C catalyst at 0.797 V (vs. SHE, standard hydrogen electrode). The electrocatalytic oxidation of biomass-derived glycerol presents a promising method of chemical transformation to value-added molecules.