Electrooxidation of biomass-derived resources allied with green hydrogen production

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Abstract

The exhaustion of fossil-fuels and the climate changes are critically impacting the environment, increasing the concerns about the ways we produce and storage energy. In this context, the relevance and opportunities for greener energy sources are continuously increasing. Thus, the energy production using green energy sources and/or biofuels is an attractive opportunity towards a greener energy consumption and storage. The electrochemical production of green hydrogen is a well-known process, performed at industrial technologies and some other still under development at the laboratory scale. Despite the prodigious advances in these technologies, the water electro-oxidation remains an important challenge due to the reaction slowness even with the use of expensive and scarce Ir-based catalyst. In this setting, the substitution of the electro-oxidation of water for biomass-derived resources arise as a stimulating opportunity to reduce the anode working potential and, consequently, the energy consumption for green hydrogen production. This great possibility of energy reduction consumption is associated with a much lower (<1.0 V) standard potential for several oxidations of alcohols/polyols compared to water, which well-known standard potential is 1.23 V vs NHE. Among these polyols, glycerol arises as a good option because it is produced in large scale as a byproduct of biodiesel production, surpassing the industrial demand. Also, its oxidation can generate value-added molecules.

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