Efficient Power- and Solar-to-Chemical Energy Conversionelectron extraction from depolymerization of biomass with phosphomolybdic acid for hydrogen evolution

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Efficient power to chemical conversion has received great attentions for the sustainable energy production in modern society. In general, (photo)electrochemical reduction reactions using water is used as a cheap and clean source of electrons can continuouslyto produce various chemicals by (photo)electrochemical reduction reactions. However, the oxidation of water for electron extractionit has some is a challenging task for practical use due to low efficiency and stability ibecause of water oxidation process. Here, we suggest the coupling of biomass oxidation and (photo)electrochemical reduction reactions for the synthesis of target chemicals. By utilizinge phosphomolybdic acid as a catalysts and a redox mediator, electrons can be readily extracted from various biomasses including lignin at a much lower potential than the water oxidation reaction potential. Besides, value- added chemicals such as vanillin and CO are produced during the oxidative depolymerization process of lignin oxidation. As a result, we could significantly reduce oxidation potential of (photo)electrochemical hydrogen production systems to allows efficient hydrogen evolution with a high Faradaic efficiency.