Evaluation of an Electrolyzer That Uses Only Water and CO_2 as Reagents to Produce Industrially Useful Products

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In recent years, there has been a tremendous rise in the emission of greenhouse gases due to excessive dependence on non-renewable resources of energy[1]. The single major component of greenhouse gases is CO_2[1]. Due to the adverse effects of CO_2 on the environment, the three main approaches – capturing, storage, and converting it into value-added products are being extensively researched over the past few decades. Electrochemical CO_2 reduction focuses on using renewable energy resources to capture and convert CO_2 into useful chemicals[2.] The combination of Electrochemical reduction of CO_2 and production of value-added products offers an enticing perspective for using CO_2 as a feedstock in an electrolyzer, considering the alarming rise in CO_2 levels. Typical Electrolysers couple water oxidation to oxygen with CO_2 reduction. It is tantalizing to churn out value-added products on both sides and replace sluggish four-electron water oxidation with a kinetically facile two-electron process. For the first time, we have been able to couple CO_2 reduction with H_2O_2 production. This work addresses the creation of an electrolyzer where two completely different electrochemical half reactions are done under similar conditions of temperature, pH, and electrolyte. Reduction half-cell involves CO_2 reduction on a well-known catalyst: copper and oxidation half-cell involves the production of industrially important chemical: H_2O_2 using $BiVO_4$ as the catalyst. Presented will be the work done to bring this electrolyzer to fruition. Additional improvement has been done by allowing $BiVO_4$ to grow in a particular plane direction.

REFERENCES:

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