**CO2 electrolysis in seawater**

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Oceans are the largest reservoir of carbon on earth. A large portion of anthropogenic CO2, dissolves in the seawater and converted in equilibrium between hydrogen carbonate and carbonate ions.1 Seawater which consisting of ~ 97 % of available water in our planet is naturally abundant and conductive, an attractive electrolyte for electrochemical CO2 reduction technology. However, composition of seawater is inherently complex, containing multiple cations and anions that may participate in CO2 electroreduction reaction.2 Our investigation shows that the calcification, as naturally occurred process in oceanic calcifying organisms, is affecting the CO2 electroreduction performance.3 Under the applied cathodic potential and in the presence of CO2, calcium ions in the seawater resulting in calcium carbonate deposition onto the nanoporous Ag,4 reducing active sites for CO2 electroreduction. Mitigation from calcification would promote a stable CO2 electrolysis in seawater. Electrochemical storage and conversion technologies have been evolved to meet specific demands of wide-ranging end-users. A self-powered CO2 electrolysis would facilitate a simplified and portable ad-hoc carbon-based fuel generation system, meeting circumstances such as inaccessibility to an external electricity source. We demonstrate a first proof-of-concept self-powered hybrid CO2 electrolysis by the coupling of a Mg anode to a nanoporous Ag cathode in 0.6 M NaCl or seawater. A spontaneous oxidation of a Mg alloy at anode driving cathodic reduction of AgCl to nanoporous Ag, which electrocatalytically reduces CO2 to CO. In conclusion, strategies to overcome calcification such as removal of calcium from the seawater, and development of anti-calcifying electrocatalyst could promote practicability of seawater as an electrolyte in CO2 electroreduction technology.



Figure 1 Schematic illustration of the interactions of dissolved ions in salt water (a) and seawater (b), under CO2 purging and an applied cathodic

**References:**

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