Molecular Co-Corrole complex for the heterogeneous electrocatalytic reduction of carbon dioxide on carbon fiber electrodes

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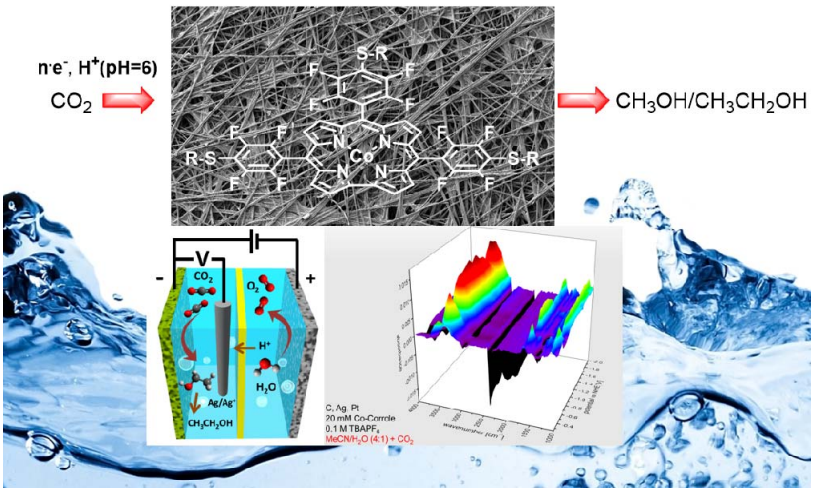
Electrochemical conversion of CO_2 to alcohols is one of the most challenging methods of conversion and storage of electrical energy in the form of high-energy fuels. The challenge lies in the catalyst design to enable its real-life implementation. Herein, we demonstrate the synthesis and characterization of a cobalt(III) triphenylphosphine corrole complex (Co-corrole), which contains three polyethylene glycol residues attached at the *meso*-phenyl groups. The Co(III) ion in the center of the 18π-electronic macrocycle is electrochemically reduced to Co(I). Herein, we report the potential dependent heterogeneous electroreduction of CO_2 to ethanol or methanol of an immobilized cobalt A_3-corrole catalyst system. In moderately acidic aqueous medium (pH = 6.0), the Co-corrole modified carbon paper electrode exhibits a Faradaic Efficiency (FE%) of 47 % towards ethanol production, a TON of 196 and a TOF of 0.011 s^{-1} at -0.8 V vs RHE over 5 hours measurement time.



[1] S. Gonglach, S. Paul, M. Haas, F. Pillwein, Sreejith S. Sreekumar, S. Barman, R. De, S. Müllegger, P. Gerschel, U.P. Apfel, H. Coskun, A. Aljabour, P. Stadler, W. Schöfberger and S. Roy, Molecular Co-corrole Complex for the Heterogeneous Electrocatalytic Reduction of Carbon Dioxide on Carbon Fiber Electrodes, manuscript under revision, March 2019