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Electrocatalysts for water oxidation and carbon dioxide reduction

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Over the last ten years, the drive to developartificial photosynthesis systems to produce solar fuels on large scales has been an area of increasing intense global research activity. Photosynthetic reactions can be divided into two half reactions - water oxidation and carbon dioxide reduction, both of which are essential to producing fuel. The significance of catalysts for both oxidation and reduction has been widely recognized in recent years, and extensive efforts have been made to search for cost-effective, earth-abundant catalytic materials with high efficiency and stability. Falling into this theme, we have previously investigated transition metal tungstates as water oxidation catalysts and nickel macrocycles for carbon dioxide reduction Recently, we have synthesized a new water oxidation catalyst - lithium cobalt germinate (Li_2CoGeO_4) - using a hydrothermal method. Details about the synthesis of this material, the characterization of compositional, structural and physiochemical properties and the evaluation of catalytic performance are presented in this work. Possible catalytic mechanisms are discussed as well. We also report new surface modification approaches to silver nanoparticles for carbon dioxide reduction. The effects of these modifications on electrochemical behavior are revealed.

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