STRUCTURAL INVESTIGATION OF THE CU/W/CO-BASED MIXED METAL OXIDE ELECTROCATALYST USING X-RAY ABSORPTION SPECTROSCOPY

NIKITA GUPTA, *Chemistry , University of Illinois at chicago , Chicago, Illinois , United states*.

Transition-metal oxides, especially nickel, copper and cobalt oxides, are potential candidates for robust water splitting electrocatalysts as they are valence-tunable, earth-abundant, cost-efficient and stock-available. Bifunctional polyoxometalate electrocatalysts are becoming more common because of their low production cost and enhanced. water splitting activity as compared to noble metals. The water electrolysis can be divided into two half reactions: hydrogen evolution reaction (HER) occurring at the cathode, while the anodic process involves the oxygen evolution reaction (OER). Both half-reactions involve proton-coupled multi-electron transfers, varied by the pH and other reaction conditions. The general mechanism of HER involves an electrochemical hydrogen adsorption step followed by an electrochemical desorption or recombination reaction. In the case of OERs, it involves the formation of adsorbed OH* on the catalyst surface with the subsequent transformation to OOH* and the eventual release of O2. We (Streb group) recently reported cobalt tungstate bifunctional catalyst deposited on copper foam, showing high water electrolysis activity. The composite catalyst showed sustained OER and HER activity in 0.1 M aqueous KOH over prolonged periods (t more than 10 h) at low overpotentials (OER: 300 mV; HER: 100 mV). But studies evaluating the mechanistic understanding of each step in water splitting electrolysis, structural changes and true active sites during HERs and OERs at high pH values still remain ambiguous. XAS was used to study the catalytic intermediates represents a novel approach to probe the catalytic intermediates and to understand the mechanism of a catalytic process which is of outmost importance for designing new and more efficient systems.