

7th World Congress on

Petrochemistry and Chemical Engineering

November 13-14, 2017 Atlanta, USA



Craig L Hill

Emory University, USA

Solar water splitting with polyoxometalates

Solar water splitting (conversion of sunlight and H₂O to H₂ fuel and O₂ or sunlight and H₂O plus CO₂ to fuel and O₂) is a potential solution to our growing energy availability and environmental concerns. The huge international effort to produce "solar fuel" (artificial photosynthesis) is commensurate with the funding from governments for this research and its potential importance.

Statement of the Problem: While we have solar electricity and this is now economically competitive with conventional electricity, we need fuel for many large-scale uses including ship and air transportation. Thus, there is a global effort to realize solar fuel. Solar fuel generation requires three unit operations, a water oxidation catalyst (WOC), generally viewed as the success-limiting factor, a light absorber-charge separator and a reduction (fuel formation) catalyst. We will describe the use of transition metal oxygen anion clusters (polyoxometalates or POMs), as H₂ generation catalysts and more importantly, WOCs. After our initial papers on POM WOCs, many groups have made these molecular versions of metal oxide WOC films and conducted a range of mechanistic and other experiments. We will describe the new POM WOCs that work in acid and how WOCs can be interfaced with photo electrodes to generate H₂ and O₂. Mechanistic studies of the four-electron-transfer process to split water, the first of their kind, will be presented and the implications of this research discussed.

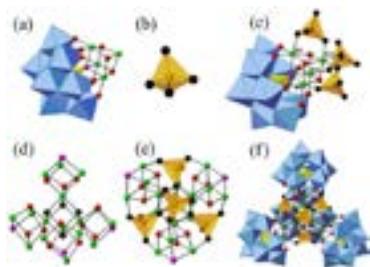


Figure.1: Different components of a soluble Ni₁₆ polyoxo-metallate (POM) water reduction (H₂ evolution) catalyst.

Biography

Craig L Hill is the Goodrich C White Professor at Emory University, works on solar fuels, smart materials, catalytic anticancer drugs and reaction mechanisms. His group uses polyoxometalates (POMs) in much of this research. He has developed catalysts for many processes with some patents licensed. He has won about 20 national and international awards and his 600+ papers with ~130 co-workers have been cited more than 25,700 times for an H index of 81.

chill@emory.edu