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Engineering ”Disorder” : From Designing New Catalysts to Reactivity in Natural Systems

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One of the greatest challenges of the 21st century will be securing cheap and renewable sources of energy. One of the most promising approaches to this challenge is to design catalysts from earth abundant materials capable of implementing key chemical reactions including the splitting water into hydrogen and oxygen (H2O ⟶ H2 + ½O2); the oxidation of hydrogen (H2⟶ 2H+) and reduction (2H+⟶ H2) of protons as well as the reduction of molecules like CO2 and N2.

Some of the most promising catalyst materials for these reactions are metal oxides and metal sulfides which commonly exist in nature. Despite the ubiquity of these materials their structures and the relationship to reactivity is often poorly understood. This may be because materials that are most reactive are often “disordered” or nano-crystalline. In our work we have been able to engineer series of metal oxides that systematically differ in their degrees of disorder. By careful correlations between XAS, TEM and reactivity we can begin to understand the effects of crystalline “order” on “reactivity”. Our results point to important correlations between “sacrificial” and “catalytic chemistry” that have implications to both catalyst design and clues to a possible role these materials may have played in the evolution of metallo-protein type catalysis.

Keywords or phrases (comma separated)

Catalysis, Materials,

Are you a student?

No

Do you wish to take part in</br>the Student Poster Slam?

No

Are you an ECR? (<5 yrs</br>since PhD/Masters)

No

What is your gender?

Female

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