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The Relevance of Sacrificial Redox Chemistry to Catalyst Design: A Study of How Disorder Changes Reaction Selectivity in Three Classes of Reactions Catalysed by Manganese (III/IV) oxides

Birnessites and closely related phases of manganese oxides are catalysts for a range of chemical reactions. These include the classical chemical demonstration of the disproportionation of hydrogen peroxide, decarboxylation reactions, the oxidation of amines to imines and water oxidation. Because these reactions are so different we seldom think about the selectivity of one reaction and what it means for the others. In this research we have studied a series of manganese oxides with different degrees of disorder. Destabilization of the manganese oxides increases the reactivity of the oxides to sacrificial reactions. Interestingly our results indicate a relationship between the sacrificial chemistry and the catalytic chemistry. We can use disorder to destabilize manganese oxides converting what are catalytic reaction through to sacrificial reactions. Our results demonstrate a relationship between the sacrificial chemistry of these systems and the catalytic chemistry that has not previously been recognized. The relationship is discussed in the context of optimizing catalysis across all classes of materials. Optimization of materials for water oxidation seems to fall between the catalytic and sacrificial limits of the materials consistent with the self-healing mechanism proposed in these families of materials.

Keywords or phrases (comma separated)

Nano catalysts, Manganese (III/IV) oxides, Sacrificial Chemistry,

Are you a student?

Yes

Do you wish to take part in the Student Poster Slam?

No

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

Yes

What is your gender?

Female

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Track Classification : Advanced Materials