Solar water splitting with complex metal oxides

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Transition metal oxides are promising candidates for the conversion of solar energy to chemical fuels. They combine reasonable semiconducting properties with excellent chemical stability and low cost. As such, they can bridge the gap between conventional PV semiconductors and molecular/biological systems. Although exciting progress has been made in the past 5 years on e.g. Fe_2O_3 and Cu_2O, further improvement of these binary oxides is severely hampered by intrinsic materials limitations. To broaden the scope of suitable materials, research efforts are currently shifting towards ternary or more complex oxides. We will discuss some recent results on two thin film complex oxide photoanodes: $BiVO_4$ and TaO_xN_y. The main challenges for these materials are to optimize light absorption, minimize bulk recombination and enhance surface catalytic activity. Several strategies to achieve this will be discussed. I will conclude by giving a somewhat broader overview of the research challenges that need to be addressed in future efforts on solar fuel production with inorganic semiconductors.