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The role of fast charge dynamics to photo-catalytic water oxidation

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The ability to resolve the interfacial dynamics of a heterogeneous catalytic reaction will be an important tool for applying theoretical calculations to chemical reactions and for designing artificial photosynthetic systems that take advantage of these dynamics. Transient optical spectroscopy at the n-type $SrTiO_3$/water interface reveals the picosecond to nanosecond kinetics of the initial hole transfer of the water oxidation reaction (assigned to $h^+ + OH^- \rightarrow OH^\cdot$) and its activation barrier as a function of surface potential. On-going ultrafast infrared studies relate the disappearance of the hole in the semiconductor with the transformation of the hydroxilated surface by an intermediate of the catalytic reaction. Other studies focus on catalysts that drive the water oxidation reaction with a much lower free energy difference, such as Co_3O_4 and IrO_2, where the reaction is initiated by a unique photodiode configuration that allows sensitivity to interfacial hole transfer rates.

Biography

Tanja Cuk has completed her PhD at the age of 26 years from Stanford University (2007) and postdoctoral studies from the University of California, Berkeley on a Miller Fellowship (2007-2010). She subsequently began an assistant professorship in the Chemistry Department at the University of California, Berkeley. She is jointly appointed to the Chemical Sciences Division (CSD) of Lawrence Berkeley National Laboratory as a faculty scientist. She has been awarded a Bakar Fellowship and a Young Investigator Award from the Air Force, in addition to a grant from the CSD division of DOE.

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