

Tuning Electrode Potential with Surface Chemistry  
Jessy B Rivest, Guo Li, Ian D Sharp, Jeffrey B Neaton,  
Delia J Milliron  
Materials Science Division, LBNL  
1 Cyclotron Rd, Berkeley, CA 94720

The ability to tune the electrochemical potential of an electrode material without changing its composition could enable improved performance in photoelectrochemistry and in energy storage. Such tuning is possible using surface chemistry: self-assembled monolayers of dipolar molecules can induce a bulk work function shift. This type of advance has been well characterized on metals, but implementation of this concept on semiconductors or insulators has not been systematically characterized. We demonstrate the modulation of the work function of titanates by more than 500mV. This points the way toward controlling the electrochemical potential to produce higher-energy batteries or more efficient catalysts without requiring new materials development.