

## Optimizing Attachment Methods and Ligand Properties for Solar Fuels

One potential method of reducing the world's reliance on fossil fuels harnesses artificial photosynthesis, or the process of using sunlight to power the transformation of abundant small molecules in the air into fuels or other chemicals. A hybrid photoelectrode allows us to accomplish artificial photosynthesis because it couples a molecular electrocatalyst, that is highly selective for single-reaction products, with a semiconductor capable of absorbing sunlight. Electrodes of this nature will eventually be able transform inputs, such as CO<sub>2</sub>, into storable liquid fuels, like methanol and ethanol, using energy from the sun — while producing only water as a byproduct. Sonochemical hydrosilylation is an integration method that has been shown by the Dempsey group to be effective at immobilizing a rhenium tricarbonyl phenanthroline complex containing a styrene attachment group, but has not been expanded to immobilize rhenium complexes with butenyl anchoring groups. By conducting a time trial experiment with bis-butenylbpyRe(CO)<sub>3</sub>Cl using sonochemical hydrosilylation, it appears that this method may be generalizable if the reaction time is increased. Additionally, it seems that the surface loading of bis-butenylbpyRe(CO)<sub>3</sub>Cl on the Si surface increases with reaction time.