

Benjamin Hoffman
Senior Division Chemistry
Synthesis of 4-Bromo-2, 2'-Bipyridine

Photovoltaic technology is currently inefficient. To improve upon the inexpensive Gratzel cell, asymmetrically substituted bipyridines bond to a metal center that can be stimulated with light and connected to a semiconductor. 4-Bromo-2, 2'-bipyridine is useful in the synthesis of these molecules, but published literature procedures are poor. I sought to find a simpler, more efficient way to achieve the target molecule. First, I attempted a directed ortho metalation of bipyridine using *sec*-butyllithium. I would have used a halogen dance procedure had this succeeded, but analysis by H NMR and 2D COSY showed that 5-, not 3-Bromo-2, 2'-bipyridine, had been produced. Next, I synthesized 2, 4-dibromopyridine using LDA and Bromine through lithium halogen exchange and halogen dance reactions, achieving moderate 20% yields, verified by H NMR of the purified product. I created a pyridine boronic acid using trimethyl borate and *n*-butyllithium, with 95% yields. I attempted a Suzuki reaction to couple these two together multiple times. It has not yet coupled successfully. This could be a result of chelation of the product to the palladium catalyst, dimerization of the boronic acid, or catalyst oxidation. In the future, I will try a Negishi coupling, a different catalyst, and a MIDA protected boronic acid in order to create the desired molecule.