CHEMISTRY Departmental Seminar

Spring 2017
CHEM 285 Schedule
Tuesdays at 4:30-5:45PM
Room Duncan Hall 250

5-16-17

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“Tandem Light-Driven C-H Functionalization
Via Biocatalysis and Photoredox Catalysis”

The development of convenient synthetic methods for green and sustainable synthesis of pharmaceutical and other chemicals has become an increasing research topic.1 Functionalization of unactivated C-H bonds is an important, yet difficult synthetic step leading to an array of enhanced properties in a particular molecule.2 We have established a tandem C-H functionalization approach utilizing visible light activation and the unique photochemical properties of Ru(II)-diimine complexes. Previously, our lab has developed light driven Cytochrome P450 biocatalysts capable of regio- and stereoselective C-H hydroxylation on a variety of organic substrates.3 In these hybrid P450 enzymes, the covalently attached Ru(II) photosensitizers provide the necessary electrons to the heme domain to activate molecular dioxygen at the active site and sustain photocatalysis.4 Recently, we implemented in our lab the trifluoromethylation (R-CF₃) of several arenes using the excited state properties of the Ru(II)-polypyridyl complexes.5 Photoredox catalysis for trifluoromethylation can be achieved on various aryl hydrocarbons and have been purified via column chromatography and HPLC and characterized with ¹H, ¹⁹F NMR, HPLC, and GCMS. Furthermore, our results indicate that P450 enzymes can indeed selectively hydroxylate trifluoromethylated arenes. Evidence as well as mechanistic insight will be presented. The utilization of both light driven methods for dual C-H functionalization will provide novel synthetic routes beneficial for the production of a variety of useful compounds.

References:

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