Alpha-olefins are straight chain hydrocarbons with a terminal double bond. Alpha-olefins are industrially significant because they are used to produce plastics, surfactants, plasticizers and synthetic lubricants. With increasing world demands, more efficient processes are needed to selectively dimerize desired alpha-olefins.

Currently, we are attempting to synthesize cobalt catalysts that can effectively dimerize short chain linear alpha-olefins into linear dimers. My goal for this summer was to synthesize a ligand that will ultimately be attached to a cobalt complex to provide a more efficient catalyst. The 4-phenyl-phosphorin ligand 2 was chosen for the following reasons: it has a small cone angle (i.e. less bulky) that will lead to the synthesis of a greater ratio of linear to branched olefins, has a benzene ring to increase steric bulk for better analysis, and phosphorin ligands have been shown to control catalytic activity. However, synthesis of 4-phenyl-phosphorin proved to be difficult due to the stable carbocation intermediate formed in the synthesis of 1-phenyl-propargyl tosylate 1. Because the carbocation intermediate was more stable than 1-phenyl-propargyl tosylate, the product of this reaction was never formed even with repeated experiments using various methods and conditions.

Further research was performed to replace the phenyl group with a t-butyl group to carry out the synthesis of a parallel phosphorin ligand, 4-t-butyl-phosphorin, and NMR and GC-MS results have confirmed the successful synthesis of intermediate products propargyl tosylate and 1,4-pentadiyne. The immediate future directions are to continue the synthesis of 4-t-butyl-phosphorin, and then ultimately coordinate the phosphorin ligand to the cobalt complex to test the effectiveness and efficiency of the resulting catalyst in dimerizing alpha-olefins.

**Synthesis of 4-phenyl-phosphorin**

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**References:**