Palladium Catalyzed α-Arylation of Ketones and Aldehydes

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The palladium-catalyzed coupling of aryl halides and sulfonates with enolates (α-arylation) has become an important process in organic synthesis. This poster will present results from studies on two poorly developed aspects of this α-arylation chemistry: enantioselective α-arylation of ketones and α-arylation of aldehydes. We will present the most general, enantioselective α-arylation of ketone enolates and the most general process for the α-arylation of aldehydes.

First, we will present enantioselective α-arylations of a variety of cyclic ketones with aryl triflates. Enantioselectivities range from 70-98% for reactions with palladium or nickel catalysts. Studies on the factors affecting enantioselectivities have been conducted, and will be described. Proper selection of reaction conditions minimizes catalyst decomposition and allows for high enantioselectivities to be observed. The development of this asymmetric process makes possible the use of asymmetric α-arylation in natural products synthesis, and we have applied this process to the synthesis of two natural products, (-)-dichroanone and (-)-taiwaniaquinol B. The total synthesis of these natural products will be presented.

Second, we will present our development of the most general α-arylation of aldehydes. Previously, most α-arylations of aldehydes occurred in low yield and with narrow substrate scope. We report improved yields and substrate scope of this reaction. Our conditions are effective for arylation of linear and branched aldehydes with aryl halides that are electron rich and electron poor, as well as sterically hindered. The catalyst precursor and ligand is important for the development of this process and will be presented.