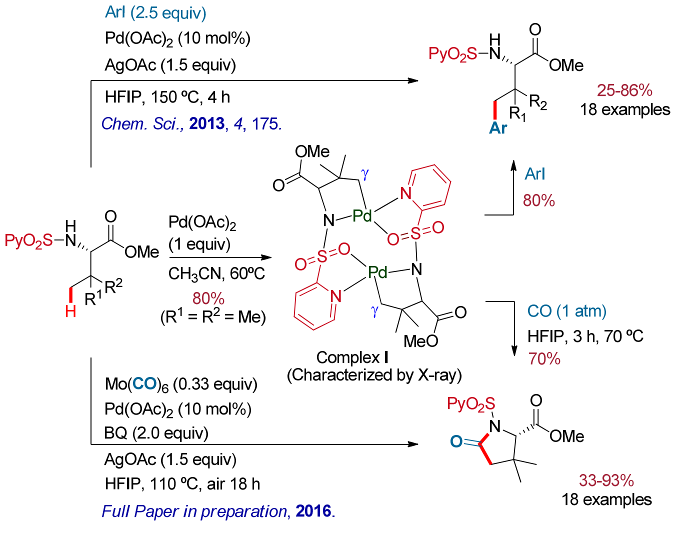
1. Publishable summary

Over the past few decades, Bergman, Hartwig, Davies, and many others have demonstrated that the selective and efficient functionalization of non-activated C(sp^3)-H bonds of simple aliphatic substrates can be achieved through diverse metal-catalyzed reactions.[1] However, achieving catalyst-controlled selective C(sp^3)-H bond functionalization of more complex substrates such as alpha-amino acids remains a challenging task. In this regard, within this project, we aimed at studying the *catalytic functionalization of inert C(sp^3)-H bonds assisted by sulfur-tethered directing groups* paying particular attention to the *straightforward chemical modification of amino acids and peptides.*

Amino acids are versatile chiral building blocks in total synthesis and ligand design.[2] However, the limited number of amino acids genetically encoded is rather limited and therefore there is a need for new methodologies to achieve their straightforward chemical modification.

The most relevant results are presented in Scheme 1. We have developed an efficient protocol to perfom the remote palladium-catalyzed gamma-C(sp^3) C-H arylation of *N*-(2-pyridyl)sulfonyl amino acid derivatives (**Phase I:** *Chem. Sci.*, **2013**, *4*, 175);[3] as well as a selective gamma-C(sp^3)-H carbonylation of *N*-(2-pyridyl)sulfonyl (*N*-SO_2Py)-protected amines by using palladium-catalysis and $Mo(CO)_6$ as carbonyl source (**Phase II:** *Full Paper in preparation*, **2016**).[4] Both functionalization processes have been applied to the post-synthetic modification of small peptides as a means of optimizing their molecular function or discovering new biologically active candidates.[5] This extension to the late-stage functionalization of more complex molecules not only adds more weight to the functional group tolerance of the methods, but also illustrates the capacity of the bidentate *N*-SO_2Py directing group to act in the presence of other coordinating elements. The ability to induce site-specific reactivity on a given molecule at otherwise unreactive sites in complex settings has tremendous significance to the field of complex molecule synthesis.



Scheme 1

In any case, general aspects of each type of C-H functionalization, including remaining challenges as well as mechanistic details, have been explored.

Bibliography

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