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New Advances in Green Technologies:

Synthesizing new drug candidates using greener methodology – a long-standing problem with a big impact on pharmaceutical business

As a company involved in technology development, we at Chicago Discovery Solutions are constantly on the lookout for new solutions that have broad implications for chemists. Our investigations have moved us to address the environmental impact of organic reactions, in particular, the traditional cross-coupling reaction of carbon-carbon bonds.

The formation of carbon-carbon bonds by transition metal-catalyzed direct functionalization of C–H bonds has recently emerged as a greener alternative. Despite the improvements in catalytic efficiency that allows reactions to proceed under milder conditions or lower catalyst loadings, this type of transformation still suffers from a major limitation with regards to the reaction medium.

Traditional cross-coupling reactions regularly use *N*-methylpyrrolidinone (NMP), dimethylformamide (DMF) or dimethylacetamide (DMAc) as reaction solvents. These solvents are undesirable because of their toxicity and high boiling points. Recent efforts have been made to execute these reactions in a greener, more environmentally acceptable media. A review published in *Green Chemistry* (1) summarizes the contributions made in this direction during the past few years.

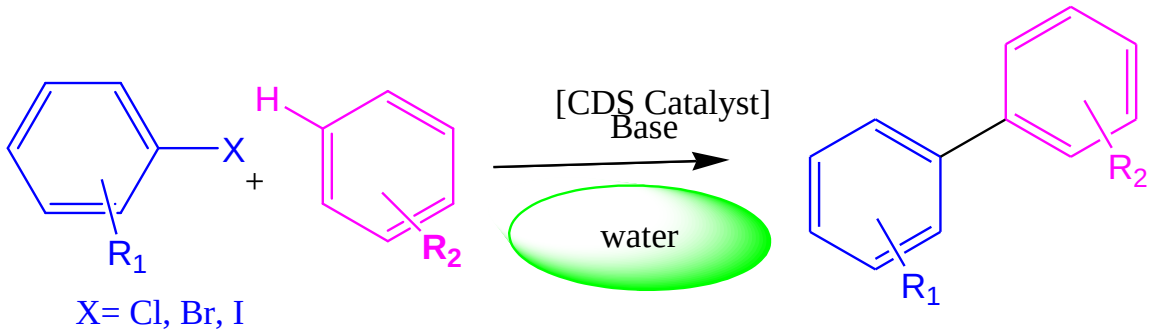

Figure 1. CDS' successful examples of direct arylation reactions in a water medium at atmospheric pressure (no need for sealed tube/ pressure reactor conditions)

One environmentally benign solvent that has commanded much attention in this arena is water. At CDS, we have developed a catalyst that performs C-H activation in water at atmospheric pressure. All attempts to do this type of transformations have been in sealed tube conditions commonly known as pressure reactors (2). We have several successful examples of direct arylation of heteroaromatics in water (Figure 1). Most importantly, by eliminating the need for pressure reactors and additives in the reaction such as detergents, our reaction conditions are far more cost effective, safer and generate less waste.

Our technology is applicable to a broad range of drug molecules containing aromatic functional groups, which are by far the most essential pharmacophore for medicinal chemistry and drug development (3). Our past experiences in effecting the C-H

activation on aromatic rings by direct metallation (4) positions us well to fill the gap in environmentally friendly methodologies in medicinal chemistry and drug development.

As a company, we are dedicated to developing new environmentally friendly technologies in the area of pharmaceutical research. Our goal is to reduce the environmental impact of synthetic Chemistry. If you would like us to assist with improving your research program, please contact us at sales@chicagodiscoverysolutions.com.

References:

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