A breakthrough for organic reactions in water

June 26 2014

Green-chemistry researchers at McGill University have discovered a way to use water as a solvent in one of the reactions most widely used to synthesize chemical products and pharmaceuticals.

The findings, published June 26 in *Nature Communications*, mark a potential milestone in efforts to develop organic reactions in water.

Chao-Jun Li and Feng Zhou of McGill's Department of Chemistry report that they have discovered a catalytic system which for the first time allows direct metal-mediated reactions between aryl halides and carbonyl compounds in water.

For the past two decades, researchers have been exploring ways to do

away with chemists' traditional reliance on non-renewable petrochemical feedstocks and toxic solvents. One important method has involved replacing the toxic solvents used in metal-mediated reactions with water – something that was previously considered impossible.

While researchers at McGill and elsewhere have succeeded in using water in metal-mediated reactions between carbonyl compounds and other halides, attempts to do so for the most challenging reaction, between aryl halides and carbonyl compounds, have never worked – until now.

Prof. Li and Dr. Zhou, a postdoctoral fellow, found that rhodium—a metal primarily used in the catalytic converters of automobiles—as a catalyst together with zinc as a mediator can make the reaction possible in water. This new technique bypasses a number of challenges posed by conventional practices in carrying out this reaction, which is widely used in synthesizing fine chemicals, biologically active molecules and pharmaceuticals. Traditional methods, discovered more than a century ago, require that moisture and air be carefully excluded from the process.

The new aqueous approach promises to "streamline synthetic sequences and make them safer and more efficient," said Prof. Li, Canada Research Chair in Green Chemistry.

More information: "The Barbier-Grignard-Type Carbonyl Arylation Using Unactivated Aryl Halides in Water", Feng Zhou and Chao-Jun Li, *Nature Communications*, published June 26, 2014. DOI: 10.1038/ncomms5254

Provided by McGill University