PRINCIPLES OF GREEN CHEMISTRY IN ORGANIC SYNTHESIS

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Aromatic compounds have wide applications, and many industrial syntheses exploit electrophilic chlorination procedure followed by a nucleophilic displacement of the chloride anion. The situation is far from ideal (chlorination-dechlorination), to say nothing of its poor correspondence to the Green Chemistry principles.

Another synthetic tool is a set of palladium-catalyzed cross-couplings, known as the Heck, Stille, Suzuki-Mijaura, Sonogashira, Kumada, Negishi, Buchwald-Hartwig, Hijama, and other named reactions, which are also based on use of aryl halogenides.

Meanwhile, there are coupling reactions which do not require metal complex catalysis or the presence of halogen in an aromatic ring. Indeed, a new synthetic methodology based on nucleophilic substitution of hydrogen (S_N^H), instead of a halogen atom, proved to be an effective tool to build a variety of carbon-carbon or carbon-heteroatom chemical bonds with an aromatic ring, as shown in Scheme below [1-3].

Other principles of green chemistry, such as atom or energy efficiency, application of solvents and catalysts (including nano-sized particles), or use of kinetic resolution for the synthesis of enantiomerically pure compounds, will also be discussed.

1. O.N. Chupakhin, V.N. Charushin, H.C. van der Plas. *Nucleophilic Aromatic Substitution of Hydrogen.* New York, Academic Press, 1994.
2. V.N. Charushin, O.N. Chupakhin, *Pure and Applied Chem.,* **76**, 1621 (2004).
3. V.N. Charushin, O.N. Chupakhin, *Mendeleev Communications,* **17**, 249 (2007).