Abstract

The development of chemical reactions for fine products synthesis in industry is a challenging goal. The ideal organic reactions have high atom-economy, require a low amount of catalyst, do not produce waste and require mild reaction conditions. These requirements drive the development of research in both academic and industrial fields.

The contributions of precious transition metals as catalysts in chemical synthesis were essential for the huge developments and achievements witnessed in the 20th century. However, the chemist's ambition for ideal, sustainable, and eco-friendly reactions is not completely fulfilled. Not only the chemical properties of transition metals are responsible for its high reactivity, but also the deep understanding of its metal-ligand affinity has greatly contributed to its broad synthetic applications. In the beginning of 1990^{s}, promising reactions disclosed the ability of abundant metals to catalyze some reactions mimicking the precious metals. However, understanding this chemistry along with expanding their synthetic applications is still an attractive research field.

In this a cumulative PhD thesis, we will illustrate new synthetic methodologies using copper as abundant metal catalyst. We will show the resurrection of old and rather useless compounds for useful and valuable synthetic applications. Moreover, we will disclose new methods for direct allylic-alkylation reactions. In this a cumulative thesis, we are trying to contribute forward for more ecofriendly and sustainable reactions in chemical synthesis.