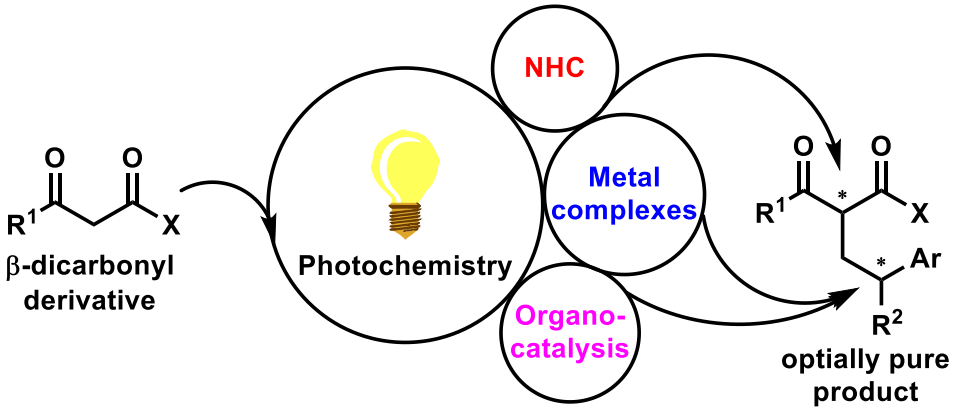
VISIBLE-LIGHT INITIATED STEREOSELECTIVE TRANSFORMATIONS OF DICARBONYL COMPOUNDS

Sunlight is a vital factor for the existence of life on our planet as the most fundamental source of energy on Earth. Most plants, algae and some bacteria can convert the energy coming from light into chemical energy that can be later used as their life processes fuel. The conversion of carbon dioxide and water in presence of sunlight into sugar molecules, where oxygen is released as a waste product, is called photosynthesis. Without this essential process, life in its form as we know it today will not be possible. Modern organic chemistry is rich in examples of light-activated chemical transformation called generally photocatalysis, where specific compounds (photocatalysts) can harvest light energy produced from natural (sun) or artificial (LEDs) sources. Those photocatalysts in the next stage transform collected light into chemical energy that can be utilized for unusual chemical processes that in normal conditions are difficult or even impossible to perform. However, most of those examples suffer from the point of lack of stereochemistry control of newly formed bonds. On this basis, stereoselective, photoredox reactions are in high demand and receiving considerable research interest.



Scheme 1. General concept of research project.

In the current project, we planned to utilize a combination of photocatalysis with compatible strategies of stereochemistry control based on chiral N-heterocyclic carbenes (NHC), complexes of transition metals like nickel or copper with optically active ligands and organocatalysis (Scheme 1). We will employ the aforementioned approaches for stereoselective functionalization of β-dicarbonyl compounds derivatives in various positions. The purpose of the presented scientific investigation is the development of new environmentally friendly (low toxicity, energy-demanding and waste-producing) synthetic routes for synthetic chemistry with potential application in natural product synthesis and drug development.