Identification of new methods of creating carbon-carbon bonds is one of the basic tasks of modern organic chemistry. Strategies using visible-light photoredox catalysis have attracted increasing attention. It enables quick and efficient synthesis of both simple organic compounds and those with a complex skeleton. The development of visible-light-promoted photocatalytic reactions, which enable rapid and efficient synthesis of complex compounds, is highly desirable from the viewpoint of cost, safety, availability, and environmental friendliness – free radical formation can occur under mild and non-toxic conditions[1].

Recently, visible light-induced photocatalysis has been extended with the strategy allowing the enantioselective synthesis of chemical compounds[2]. Asymmetric catalysis for stereocontrolled synthesis of biologically important compounds, natural products and their analogues is a rapidly growing field in modern organic chemistry[3]. It allows for the selective formation of enantiomerically pure compounds that can be used in various fields, most of all in the pharmaceutical industry. It is well-known that properties of a compound are closely related to its absolute configuration. Product of a given configuration can provide a therapeutic effect, while the same compound but with the opposite configuration may exhibit lack of biological response or even cause negative effects on a human body. And indeed, the vast majority of synthetic drugs approved in 2010 by FDA (Food and Drug Administration) were chiral and, more importantly, enantiomerically pure[4]. Therefore, the development of methods for the synthesis of pure enantiomers is of great importance.

Whereas asymmetric catalysis is known for its economic advantages in generating nonracemic chiral compounds, visible light can assist such transformations as an abundant and environmentally friendly source of energy to induce or activate chemical reactions. Combination of asymmetric catalysis with visible light offers promising avenues for sustainable synthesis. It allows for the utilization of renewable energy sources and promotes efficient and selective reactions, thereby reducing waste and enhancing atom economy. The aim of the project is to combine the potential of asymmetric catalysis with the tool of photochemistry, which can lead to the discovery of novel transformations and enable the synthesis of complex molecules with high levels of stereochemical control. In addition, the synthetic methodologies proposed in the project opens up new opportunities for the development of unique reaction schemes, opening access to compounds that cannot be obtained using classical methods.

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