

Enantioselective thiyl radical catalysis: catalyst design and application

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Progress in chemistry, and organic chemistry in particular, is essential for our future. Specifically, catalysis holds a great promise for the sustainable production of relevant organic molecules such as pharmaceuticals and agrochemicals, which have a big impact on our lives. The development of new catalytic processes is central to the synthesis of diverse molecules. Particularly important are chiral compounds with a well-defined spatial arrangement. For instance, two molecules, which are mirror images of each other (enantiomers), can interact differently with chiral enzymes in our body triggering different responses; one of them can be undesired or even harmful. For this reason, access to single enantiomers of these compounds is often an absolute requirement. An efficient synthesis of enantiopure products, however, is challenging and requires the development of chiral catalysts with well-designed functions and high performance. Despite the great advances in this field of research, there are many underdeveloped areas, which hold a great promise for advancing our abilities to selectively build chiral molecules. Thiyl radical catalysis is particularly interesting as it enables diverse types of radical processes. In the last decade, the field has grown at a significant pace, which significantly enlarged the number of compounds available by this technology. Chiral thiyl radical catalysts, which enable controlling the stereoselectivity of these processes, however, are scarce. In this project, we address this gap by the design of new chiral thiyl radical catalysts and their application in stereoselective construction chiral compounds. This would enable harnessing the full potential of the thiyl radical catalysis and give efficient access to targeted group of chiral molecules with a well-defined spatial arrangement, which are difficult to prepare using currently available methods. In the future, the new catalysts might find applications in the synthesis of drug candidates or new materials.