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„Photoswitchable catalysis in colloidal systems”

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Abstract

Switchable catalysis is a relatively new and exciting area in chemistry. It main task is to establish control over chemical reactions. In nature, biochemical processes are controlled by effectors which, depending on the current needs of the body, can turn on/off selected chemical reactions. The implementation of such a mechanism in the laboratory is quite a difficult task. Therefore, scientists often resort to simple stimuli such as light. Given the small number of photoswitchable catalysts with a broad spectrum of action, we decided to create a new concept that will allow in the future to control several reactions simultaneously, as it happens in living organisms.

Chapter 3 of this paper presents a review of the literature on various switching catalysts, taking into account the factors that determine this control. A separate section is devoted to photochromic ligands, the spatial and electronic changes of which, due to the absorption of radiation, allow to control chemical reactions.

Chapter 4 describes an overview of the results of own research. It was divided into two parts. The first concerns a photoswitching organocatalyst immobilized on gold nanoparticles. The experiments confirmed the possibility of controlling chemical reactions through conformational changes on the nanoparticle surface. The second part of the chapter describes models based on the NHC ligands. Although these systems did not show catalytic activity, they provide valuable information to develop this concept further.

Chapter 5 contains a brief description of the experiments. Each procedure was supplemented with the type of chromatographic technique used to isolate the chemical compound and the results of proton magnetic resonance analysis. For the target compounds, the structures were additionally confirmed by carbon spectra and mass spectrometry.

Chapter 6 summarizes the results presented in the dissertation, which lay the groundwork for future research in the field of photoswitchable catalysis.