CO_2CHEM - REDOX-NEUTRAL PHOTOCATALYTIC C-H CARBOXYLATION OF HYDROCARBONS WITH CO_2

Dorota Gryko, *Institute of Organic Chemistry, Polish Academy of Sciences, Poland*

Burkhard König, *Faculty of Chemistry and Pharmacy, University of Regensburg, Germany*

Our planet is currently struggling to cope with the consequences of careless human activity: degradation of the environment resulting from contamination of flora and fauna with plastic, extinction of plant and animal species and consumption of our limited fossil fuel resources. In October 2018, the IPCC (Intergovernmental Panel on Climate Change) published a special report on global warming, which is mainly caused by excessive carbon dioxide (CO_2) emission. **Sustainable development from now on should be associated with lowering CO_2 production and utilization of efficient energy sources. Therefore, we must immediately reduce the emission of CO_2 to the atmosphere, but on the other hand, *we should consider what we can do with already existing in atmosphere* CO_2*?*** It is a task for every researcher in particular chemist who can use technological advances, modern laboratories and materials, and above all - their knowledge to solve environmental problems.

An example of a process, which reduces the use of fossil fuels is the Fischer-Troposh synthesis - thanks to which mixtures of liquid hydrocarbons can be obtained from the mixture of carbon monoxide and hydrogen. However, this process occurs at very high temperatures and is still not sufficiently ecological. As a paradox, in order to become greener, we must learn from the one we are trying to save, Nature. An example of a process which can inspire us is undoubtedly photosynthesis. In this process, light energy is converted into chemical energy, with the consumption of CO_2. It has only been recently that organic chemists have started to realize the potential of light and have begun to utilize it to drive reactions. However, shining light onto a reaction usually has no effect; one must use a catalyst that will transfer the lights energy in a positive way. This is known as "*Photocatalysis*". The use of visible light as a source of energy can be a response to problems such as exhaustion of traditional energy sources, environmental pollution, or the economic crisis. Inspired by nature we decided to go a step further and use not only visible light as a source of energy, non-toxic catalysts similar to those used by Nature in photosynthesis, but also CO_2 in organic synthesis.

This proposal aims to develop the synthetic and mechanistic basis for the redox-neutral C-H carboxylation of saturated hydrocarbons with carbon dioxide. Application of visible light and carbon dioxide in organic synthesis **opens up new and exciting possibilities of synthesizing interesting, complex molecules in an efficient and cost effective way. Such methodologies should and will be implemented, in due course, by chemical industry.**