SUSTAINABLE, PHOTOCHEMICAL TRANSFORMATIONS WITH DIAZO REAGENTS AS A SOURCE OF REACTIVE INTERMEDIATES

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Henry David Thoreau wrote: „*In Wildness is the preservation of the world*". Even though in recent years we recognized the importance of protecting our environment, in our daily functioning little is left from Nature's Wildness. In fact, **the only element that we experience every day is sunlight**. We always take into account its most obvious feature which is fueling the photosynthesis, but the sun improves our reality in many other ways. Human life and health are closely related to natural light – it is sufficient to recall that by affecting the production of melatonin our circadian rhythm changes. Another well-known example: under UVB radiation 7-dehydrocholesterol present in our skin is converted to vitamin D_3, vital to our proper functioning and development. Moreover, it is common knowledge that sunlight has positive impact on our mood and enhances our productivity. The above data significantly affect the development of modern technology – they are reflected *inter alia* in artificial lighting design intended to mimic the sunlight. We can also notice how strongly they are manifested in modern architecture – the glass trend initiated in 1950s is maintained not only for the aesthetic value but also for the functionality in context of delivering the natural light.

The abovementioned examples only scratch the surface of benefits given to us by light. At the same time **it is extremely effective force which we can successfully exploit for, among others, chemistry**. Photocatalysis has been already applied in industrial synthesis of rose oxide or artemisinin. The main advantage of these processes is the fact that thanks to light we can eliminate the use of catalysts often containing toxic, scarce and expensive metals.

IN SIMPLE TERMS, SOLAR-DRIVEN PROCESSES ARE A DIRECT ROUTE TO MORE ECOLOGICAL, SUSTAINABLE CHEMISTRY. WOULD NOT IT BE WONDERFUL IF WE COULD APPLY SUCH NATURE DERIVED FORCE FOR MOST CHEMICAL TRANSFORMATIONS AND PROMOTE IT IN INDUSTRY?

To meet the demands of the development of environmentally benign transformations and to reduce the use of precious metal catalysts, we envisioned **visible light as a source of energy for the activation of diazo reagents which are a rich source of reactive intermediates**. Unlike carbene chemistry induced by metal catalysts, photochemical reactions of diazo compounds promoted by visible light are less explored. Recently it was shown that diazo reagents may be activated under visible light-irradiation. We have also proved that reactive species could be generated even from non-absorbing diazo compounds simply by addition of a photocatalyst. Abovementioned discoveries convinced us that **this field has a tremendous potential to expand general synthetic toolbox but most importantly to pave the way for increased development of light-based methodologies**. The intermediates generated by the means of photochemistry may serve to construct difficult to obtain or so far unknown compounds.

The main objective of the project is to to unveil general reactivity modes of diazo compounds under visible light-irradiation and carefully study the nature and properties of diazo-derived reactive species and subsequently to design new photochemical reactions. We expect that deeper understanding of mechanisms of solar-driven transformations and thorough insight into diazo chemistry will be a huge step towards green and environmentally friendly chemistry.