

RF-Module  
MSc Chemistry, UzK

**Inorganic and Organic Photochemistry as Tools for  
Protecting and Releasing Small Molecules**

**PhotoChem \_ ABSTRACT**

**Prof. Axel Klein** (Department of Chemistry and Biochemistry, UzK, Inorganic Chemistry) <https://klein.uni-koeln.de/>

**and**

**Prof. Axel Griesbeck** (Department of Chemistry and Biochemistry, UzK, Organic Chemistry) <http://www.oc.uni-koeln.de/griesbeck/index.html>

**PhotoChem RF-Module:**

Light is the perfect reagent to initiate chemical processes in a spatially and timely controlled manner. It is a traceless reagent because it disappears if consumed by a photophysical process or if it does not interact with matter. So, in contrast to all other reagents, its use can be detected as a chemical or physical alteration of matter but after end of the light-matter interaction period, it has completely disappeared. This effect of light/matter interaction can be used for the synthesis of very unusual new molecules, often with surprising properties such as high strain, high reactivity and the potential for use as new materials. The effect of novelty has to do with the fact that processes that are highly endergonic can be realized with the detour among high-lying electronically excited states.

One specific application of photochemistry is the preparation of photoreleasing protecting groups (PRPG) that are activated by the absorption of light only. As such, these protecting groups can be used for orthogonal protection chemistry. It is possible to release nearly every functional group by application of PRPG and therefore these groups are currently highly attractive alternatives to classical protecting groups that function via acid-, base-, redox-, metal-, enzyme-induced release. In order to explain these remarkable property of photo-activated protecting groups, we are concentrating in this lecture series

Key words and content of the lectures and seminars:

- basics of photochemistry
- photochemical rules, laws, principles, concepts and astonishing features,
- “organic” and “inorganic” photochemistry – is there a difference?
- Jablonski diagrams
- Energy and electron transfer steps
- Protecting groups in chemistry

- Orthogonality in chemistry
- Primary photochemical steps
- Combination: photoreleasing protecting groups (PRPG)
- Photorelease of functional groups
- Photorelease of large molecules, biomolecules
- Photorelease of small molecules
- Ethane, Ethene, Ethyne
- Formaldehyde  $\text{H}_2\text{CO}$
- Nitrogen  $\text{N}_2$
- Carbon dioxide  $\text{CO}_2$
- Carbon monoxide  $\text{CO}$
- Nitric oxide  $\text{NO}$
- Nitrogen and oxygen atoms
- What might be good reasons for the release of small molecules?

**WiSe24/25: Start Tuesday October 8<sup>th</sup> 2024**

The module will be held in English and will be exclusively offered in this winter semester on Tuesdays (12:00 - 13:30 pm in the Exp Seminarraum II) and special seminar days (TBA).