Project description

**Title**: Selective protein modifications using heterogeneous photoredox catalysis

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**Project description**: Nature has developed an impressive toolbox to increase the complexity of protein structures via post-translational modifications (PTMs). This diversity plays a key role in many biological processes and consequently, chemical protein modification is an important tool for studying proteins and their applications. The synthetic chemist’s ability to mimic these transformations is limited as most reactions suffer from selectivity issues and occur at conditions that disrupt the protein’s function and architecture. Photoredox catalysis (PRC) enables reactions at a specific amino acid under mild conditions by matching single electron reduction/oxidation potentials (Fig. 1). To date, PRC is mainly carried out using expensive, ruthenium or iridium complexes which are potentially toxic for biological substrates or small organic molecules which are prone to degradation.

In this interdisciplinary project you will investigate the utilization of various graphitic carbon nitride polymers (g-C3N4) as cheap, non-toxic heterogeneous photoredox catalysts for selective protein modifications using visible light. You will initially develop and study transformations on simple (protected) amino acids and ultimately study their regio- and chemoselectivity on small peptides. At a later stage you will apply your reaction systems on selected biomolecules. You will also familiarize yourself with the preparation of g-C3N4 materials, solid-phase peptide synthesis and various analytical techniques. Your results will contribute to the development of novel chemical protein modifications and foster its implementation for probing natural systems, creating therapeutic conjugates and generating novel protein constructs.

**Required background**: You should have a background in organic synthesis. Experience in material chemistry or peptide synthesis will be an advantage.


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