

Protein modifications is an important tool for probing post-translational modifications, creating antibody-drug conjugates, protein structure, dynamics as well as protein-protein interactions. The ability to manipulate proteins give us unlimited possibilities to shed light and understand protein function and structure. Because of this protein labelling as well as modification with a usage of chemical and enzymatic tags is broadly use in many fields including medicine, chemistry and biology. Throughout the years a number of methods based on chemical or enzymatic protein modification have emerged. While, many examples of protein chemical and enzymatic functionalization exist those that provide higher selectivity and site-specificity are rare. Moreover, many of the site-specific tags for protein labelling are not suitable for usage with large biologicals systems. Taking into account many of mentioned challenges regarding proteins modifications and labelling, in this project research we aim to combine chemical reactions together with chemoenzymatic methods to develop new useful tools for site-specific protein modifications. We will also improve our previous short-peptides tags that are selective towards zinc ions. We think that this approach due to its compatibility with biological systems and ease of use will expand the possibilities in protein engineering field. Additionally, thanks to our broad knowledge in chemical and biological tagging strategies we will provide an impressive range of methods suitable for working in cell environment. This research project will focus on development of new chemoenzymatic methods that allow site-specific incorporation of tags to accomplish high selectivity and specificity in field of protein modifications.