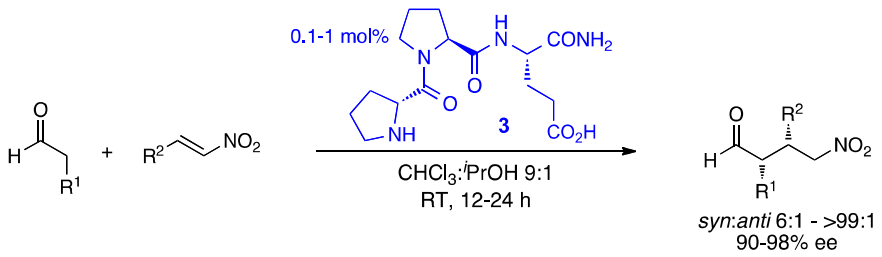

Peptides as Asymmetric Catalysts

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In nature, proteins fulfill manifold different functions and are crucial as, for example, enzymes or templates for the controlled formation of structural components such as bones. The Wennemers group is intrigued by the question whether also peptides with significantly lower molecular weights compared to proteins can fulfill functions for which nature evolved large macromolecules. Specifically we ask whether peptides can serve as effective asymmetric catalysts, templates for the controlled formation of metal nanoparticles, synthetic collagen based materials, or tumor targeting vectors.

The lecture will focus on the development of peptides as asymmetric catalysts. Tripeptides of the general type H-Pro-Pro-Xaa (Xaa = amino acid with a carboxylic acid) will be presented that are effective catalysts for aldol reactions and conjugate addition reactions between aldehydes and nitroolefins.[1] The peptides allow for enamine catalysis with catalyst loadings of as little as 0.1-1 mol% and provide synthetically versatile products in high stereoselectivities. Several synthetically valuable compounds such as γ-amino acids, pyrrolidines, γ-butyrolactones and γ-butyrolactams are easily accessible using this methodology.

The scope of these peptide-catalyzed reactions will be presented and recent insight into the mechanism as well as the importance of the conformational properties for effective catalysis will be discussed.[1-4]

References

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