Zirconium-substituted polyoxometalates as artificial proteases

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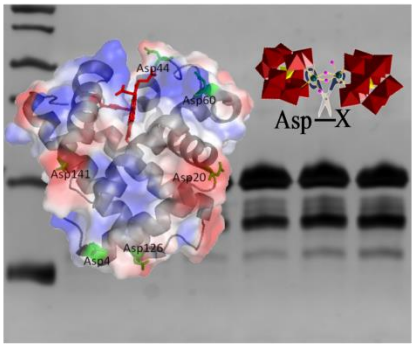
Selective hydrolysis of proteins is an important procedure in numerous biochemical applications. Based on the non-covalent, electrostatic interaction between negatively charged polyoxometalates (POMs) and positive surface domains of proteins[1], we recently introduced a conceptually new approach in the development of artificial proteases by using POMs as ligands for Lewis acid metal ions. In our approach the POM acts as a ligand for the Zr ion, and due to its three-dimensional shape and negative charge it also induces the selectivity that is necessary for a controlled fragmentation of the polyamide backbone. Zr(IV)-substituted POMs were proven to be catalytically active towards the hydrolysis of the highly inert amide bond in dipeptides and oligopeptides.[2] More importantly, these POMs were shown to display unprecedented hydrolytic activity towards insulin chain B, lysozyme, myoglobin and albumin proteins.[3] The hydrolysis occurs at peptide bonds which are located either at clearly defined positive patches that are able to accommodate the POM ligand, or on the interface of positive surface zones containing negatively charged Asp or Glu residues that allow for additional anchoring of Zr(IV).



1. Goovaerts V., Stroobants K., Absillis G., Parac-Vogt T.N., *Phys. Chem. Chem. Phys.*, **2013**, *15*, 18378.

2. a) Absillis G., Parac-Vogt T. N., *Inorg. Chem.*, **2012**, *51*, 9902. b) Ly H.G.T., Absillis G., Parac-Vogt T.N., *Dalton Trans.*, **2013**, *42*, 10929.

3. a) Stroobants K., Moelants E., Ly H.G.T., Proost P., Bartik K., Parac-Vogt T.N., *Chem. Eur. J.*,**2013**, *19*, 2848.b) Stroobants K., Goovaerts V., Absillis G., Moelants E., Proost P., Parac-Vogt T.N., *Chem. Eur. J.,* **2014**, *20*, 9567. c) Stroobants K. , Absillis G., Moelants E., Proost P., Parac-Vogt T.N.**,** *Chem. Eur. J.* **2014**, *20*, 3894. d) Sap A, Absillis G., Parac-Vogt T.N**,** *Dalton Trans.* 2015, 44, 1539. e) Ly, H. G. T.; Absillis, G.; Janssens, R.; Proost, P.; Parac-Vogt, T. N. *Angew. Chem. Int. Ed.* **2015,** *54*, 7391.