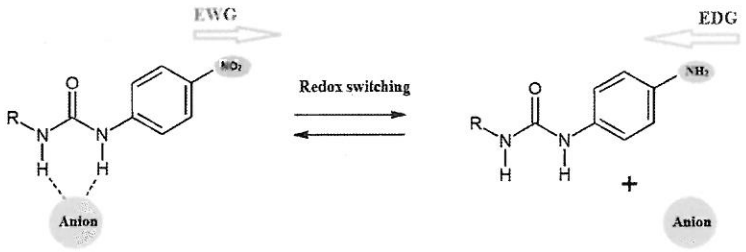
Electrochemical Investigation of Ureido-Sulfonamidic Receptors, Supramolecular Structures for Binding Phosphates

Student: Ing. Karolína Salvadori
Supervisor: Ing. Petra Cuřínová, Ph.D.
Supervising Experts: Prof. Dr. RNDr. Pavel Matějka, Prof. RNDr. Jiří Ludvík CSc.



The key role of anionic species in biological and environmental issues has been well recognized and the problems associated with disrupted balance of anions in nature represent currently a hot research topic. Among the most widespread anionic pollutants belong phosphates, which are known to cause eutrophication of water. Moreover, their insufficient removal from body fluids can lead to serious health issues.[1]

For these purposes, the anion recognition, elimination, and sensing would find applications in many areas including medicine or environmental chemistry. The preparation of receptors with high binding constants towards target anion is important, however, the same importance should be dedicated to subsequent anion decomplexation. The appropriate approach to reach this capability is based on the preparation of synthetic receptors that contain an electrochemically responsive group.[2]

Therefore, the aim of our research is the design and synthesis of anionic receptors with suitable binding sites for phosphates, as well as the determination of their binding ability and electrochemical behaviour. The binding ability of prepared receptors was evaluated in

a HB-competitive solvent (DMSO) using the NMR or UV-vis titration experiments. The experimental results demonstrate a considerable selectivity of the prepared receptor towards phosphates compared to other biologically important anions such as Cl^-, NO_3^-, and HSO_4^-.

Based on these results, we decided to incorporate the $-NO_2$ group into the molecule of the receptor because such a transducer (electrochemical/optical) responsive to the presence of the target anion would be able not only to ensure recognition and sensing but its reduction would be useful to suppress the binding ability. Then the redox transformation of such a probe could be useful for electrochemical degradation of the complex.

Acknowledgements:
This work was supported by Czech Science Foundation (GAČR 20-07833S) and by the grant of Specific university research A2_FCHI_2021_002.

References

1. Sessler, J. L.; Gale, P. A.; Cho, W. Anion receptor chemistry. The Royal Society of Chemistry: UK, 2006.
2. Beer, P. D.; Gale, P. A.; Chen, Z. Electrochemical recognition of charged and neutral guest species by redox-active receptor molecules. *Adv. Phys. Org. Chem.* **1999**, *31*, 1–90.