Rotaxanes, catenanes and macrocycles: Using the supramolecular toolbox for the design of novel catalysts

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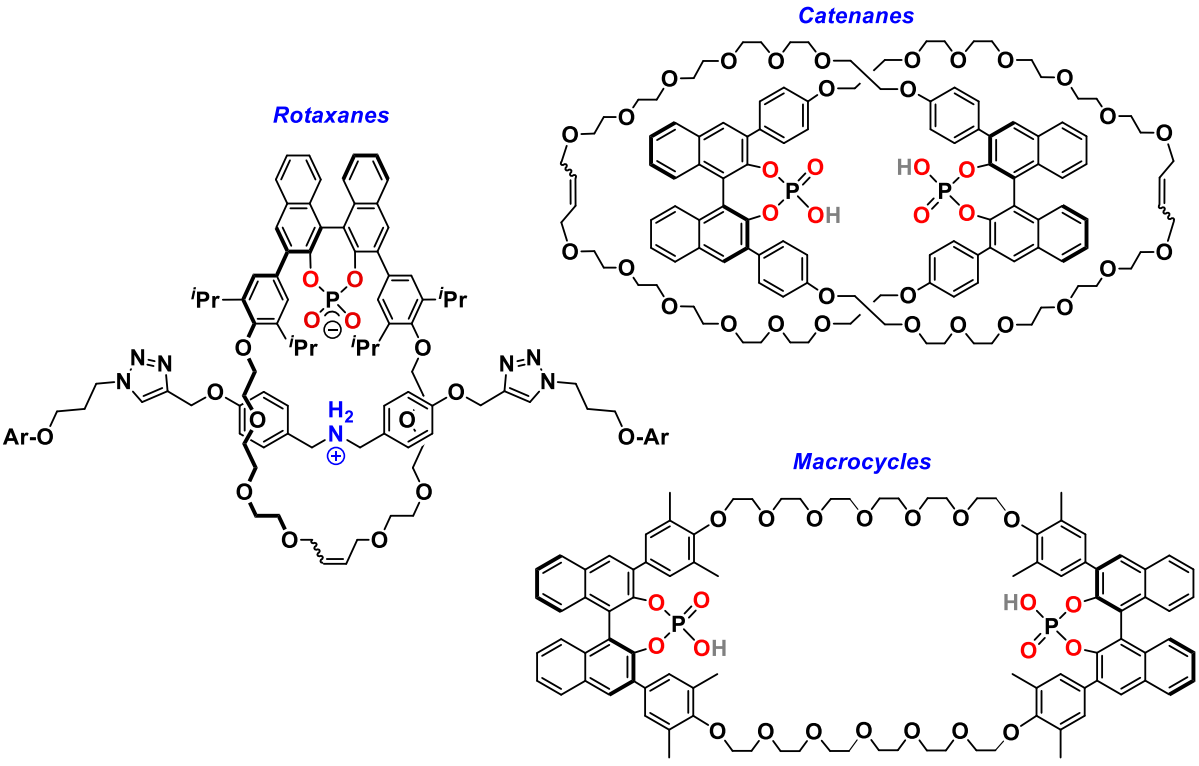
The development of highly efficient organocatalysts has revolutionized chemical catalysis in the last decades. Especially the use of chiral Brønsted-acids, such as 1,1´-binaphthyl-phosphoric acids, has enabled a plethora of highly useful stereoselective transformations.

Our group has recently developed chiral [2]rotaxanes,[1] [2]catenanes[2] and non-interlocked macrocycles[3] based on 1,1´-binaphthyl-phosphoric acids. These were successfully applied as catalysts for various transformations, such as enantioselective transfer-hydrogenations, Michael-additions and fluorinations.

In our research, we are investigating how the special nature of the mechanical bond influences the application in catalysis. In this context, we develop novel methods for the synthesis of the desired interlocked catalysts, we investigate the special nature of bifunctional catalysts and we try to approach catalyst structures with mechanical chirality.



References:

1) N. Pairault, H. Zhu, D. Jansen, A. Huber, C. G. Daniliuc, S. Grimme, J. Niemeyer, *Angew. Chem. Int. Ed.* **2020**, *59*, 5102-5107.
2) a) D. Jansen, J. Gramüller, F. Niemeyer, T. Schaller, M. C. Letzel, S. Grimme, H. Zhu, R. M. Gschwind, J. Niemeyer, *Chem. Sci.* **2020**, *11*, 4381-4390; b) R. Mitra, H. Zhu, S. Grimme, J. Niemeyer, *Angew. Chem. Int. Ed.* **2017**, *56*, 11456-11459; c) R. Mitra, M. Thiele, F. Octa-Smolin, M. C. Letzel, J. Niemeyer, *Chem. Commun.* **2016**, *52*, 5977-5980.
3) M. Thiele, T. Rose, M. Lõkov, S. Stadtfeld, S. Tshepelevitsh, E. Parman, K. Opara, C. Wölper, I. Leito, S. Grimme, J. Niemeyer, *Chem. Eur. J.* **2023**, *29*, e202202953.