

Fluorinated Cages and Macrocycles as Organic Materials

Bernd M. Schmidt^{1*}

¹ Institut für Organische Chemie und Makromolekulare Chemie, Heinrich-Heine-Universität Düsseldorf, Düsseldorf, 40225, Germany
bernd.schmidt@hhu.de

Supramolecular nanostructures can be efficiently constructed from simple molecules through self-assembly. In our research, we combine supramolecular chemistry with polymer mechanochemistry^[1] and photochemical activation^[2] to develop a diverse range of organic materials.^[3] A key focus of our work lies on partially and highly fluorinated macrocycles and cages, synthesised using dynamic covalent imine chemistry, as lightweight porous materials for CO₂ and H₂ uptake and separation.^[4] In the last year, we have demonstrated a multifold post-modification strategy for fluorine-substituted assemblies, enabling multistep supramolecular chemistry using readily available isocyanates.^[5] This approach allows precise tuning of the exterior chemical environments of macrocycles and cages after assembly.

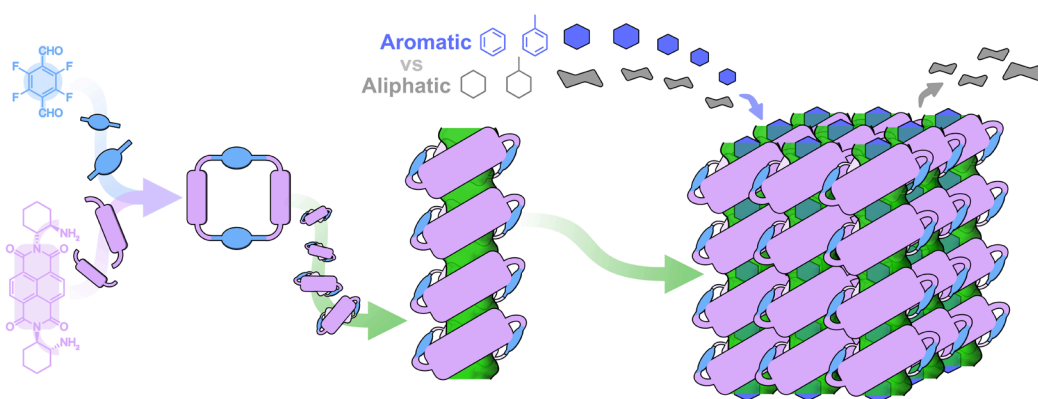


Fig. 1. Schematic representation of the synthesis of the supramolecular squareimine-based crystalline functional material, as well as the general approach of using the porous crystals for adsorption with high selectivities for the sieving of aromatic compounds.^[6]

Now, we introduce a novel class of electron-deficient macrocycles with a distinctive rectangular architecture. These squareimines optimise attractive supramolecular interactions within their pore, facilitating the selective separation of aromatic hydrocarbons from aliphatic mixtures. The crystalline material is obtained directly from the reaction mixture in high yields and exhibits rapid adsorption kinetics along with exceptional selectivity for aromatic compound sieving.^[6]

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Personal Data

Dr. Bernd M. Schmidt
Heisenberg Research Group Leader

Heinrich Heine University Düsseldorf
Institute of Organic Chemistry and
Macromolecular Chemistry
Bldg. 26.33 Floor O2 Room 34
40225 Düsseldorf, Germany

www.bmschmidtlab.de



Professional Experience

Since 03.2024	Heisenberg Research Group Leader (Organic Chemistry), HHU Düsseldorf (Germany) Functional Supramolecular Systems
02.2018 – 02.2024	Junior Research Group Leader (Organic Chemistry), HHU Düsseldorf (Germany) Functional Supramolecular Systems
2016 – 2018	Postdoctoral Research (Organic Chemistry), HU Berlin (Germany) with Prof. Dr. Stefan Hecht
2014 – 2016	Postdoctoral Research (Supramolecular Chemistry), The University Of Tokyo (Japan) with Prof. Dr. Makoto Fujita
2013 – 2014	Postdoctoral Research (Organic Chemistry), HU Berlin (Germany) with Prof. Dr. Stefan Hecht
2009 – 2013	PhD Thesis (Inorganic Chemistry), FU Berlin (Germany) with Prof. Dr. Dieter Lentz
2010 & 2012	Research at the Institute for Molecular Science, Okazaki (Japan) with Prof. Dr. Hidehiro Sakurai
2004 – 2009	Bachelor and Master Studies in Chemistry, FU Berlin (Germany)

Honours and Distinctions

2024	<i>ChemComm</i> Pioneering Investigator
2024	2024 Thieme Chemistry Journals Award
2023	Heisenberg Fellow of the DFG
2020	RSC <i>Materials Horizons</i> Advisory Board Member
2022	Dr. Otto Röhm Award
2023	JSPS BRIDGE Fellowship
2021	Finalist for the Falling Walls Science Breakthrough of the Year 2021 in Physical Sciences
2020	Germany's Young Investigator of EuChemS Division of Organic Chemistry
2020	Elected Member of the Young Academy of the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts
2019	<i>ChemComm</i> Emerging Investigator
2016	Humboldt Foundation Feodor Lynen Return Fellowship
2014	Humboldt Research Fellowship (2 years)
2014	DFG Postdoctoral Research Fellowship