Group : Dynamic Polymers
Project : **Smart Materials – Dynamic Imine Polymers**
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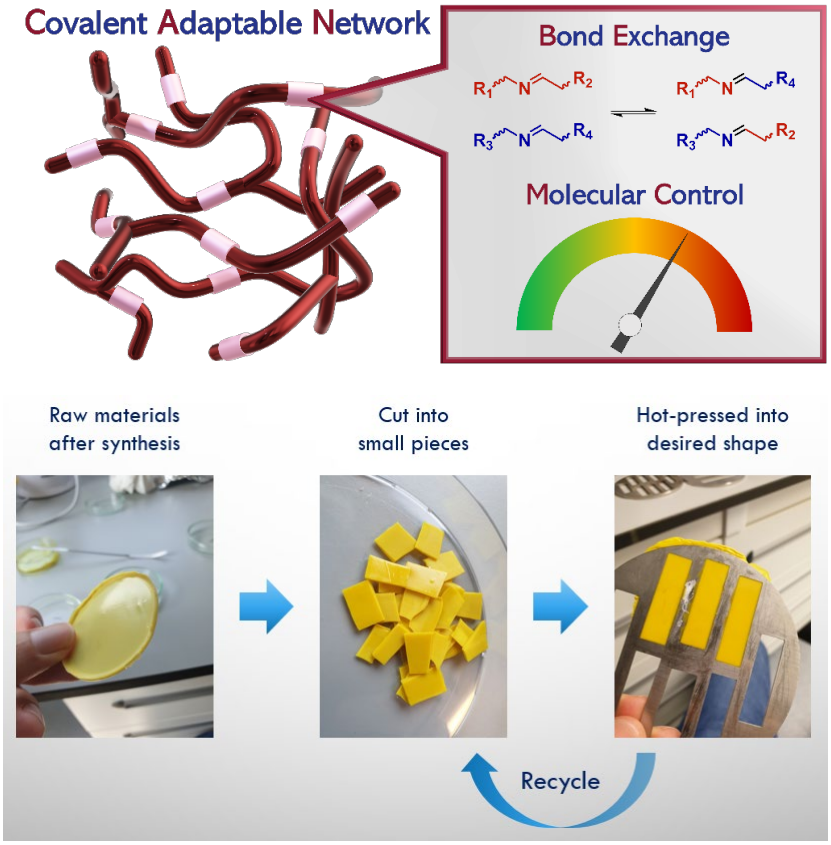
Introduction
In this project you will be focussing on the development and characterisation of *smart* materials. We consider a material *smart* when it has several dynamic features such as stimuli responsiveness or self-healing ability.[1, 2]



For the synthesis of these materials we construct *polymer networks* that consist of *dynamic* building blocks. The beauty of the dynamic parts in the network structure is that it creates a molecular flow into the otherwise static material. By precise design, this dynamicity can be controlled to develop materials with selective properties.[3]

As the dynamic component we mainly focus on reversible imine chemistry. Imines, which are basically double bonded C=N moieties, have the ability to interact with each other and exchange their end groups. This bond exchange can be influenced based on the molecular structure of the selected monomers.[4] We envisioned that especially aromatically linked imines are excellent candidates to tune the bond exchange, and therefore the macroscopic properties of the material. Earlier work has already established these imine-based materials to be recyclable and self-healing.[3]

The overall project consists of a narrow collaboration between the groups of Organic Chemistry and Physical Chemistry and Soft Matter. The organic part of the project will focus mainly on the *synthesis* and characterisation of different types of monomers, whereas the physical part of the project will focus more on the characterisation of the polymeric materials. *Rheology* will be used a powerful tool to study these materials and offers a broad spectrum of possibilities to investigate everything a certain material can and cannot do. Based on the interest of the student, they can choose to have a broader focus on either the organic or the physical part as well.

Techniques to be used
- Organic synthesis, purification and material processing
- Characterisations: NMR, IR, MS, UV-VIS
- Material testing: Rheology, DMA, TGA and more to be determined.

More information
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References
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2. F. García, J. Pelss, H. Zuilhof and M. M. J. Smulders, *Chem. Commun.*, 2016, **52**, 9059-9062.
3. S. K. Schoustra, J. A. Dijksman, H. Zuilhof and M. M. J. Smulders, *Chem. Sci.*, 2021, **12**, 293-302.
4. S. K. Schoustra, T. Groeneveld and M. M. J. Smulders, *Polym. Chem.*, 2021, **Advance Article**.