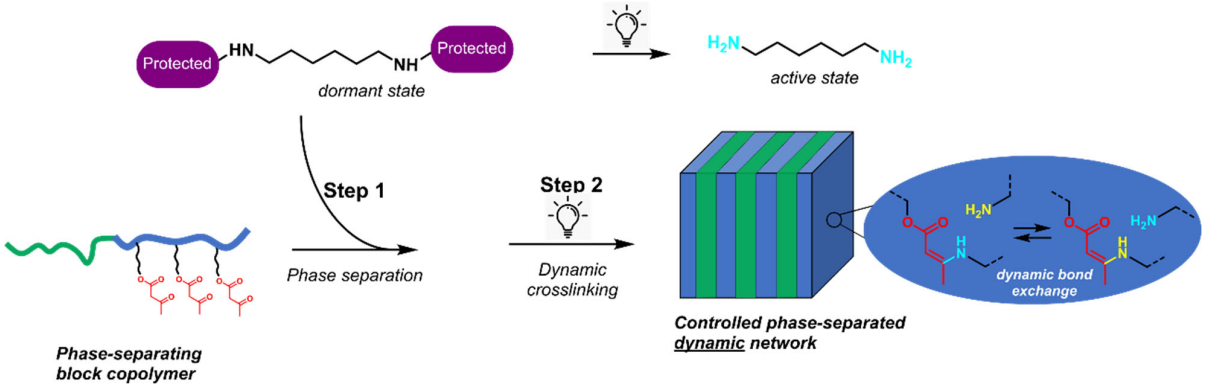
Group : Dynamic Polymers
Project : **Controlled phase-separation in dynamic polymeric materials**
Supervisors : Maarten M. J. Smulders

Introduction

The emergence of covalent adaptable networks (CANs) was a recent breakthrough, opening routes to recyclable thermosets, a concept first proposed in 2010. These networks are built up from dynamic, exchangeable covalent bonds that impart the network with the possibility to rearrange. Thermal and mechanical properties of CANs have been manipulated through the network components, catalysts, or exchange chemistries. However, few examples have exploited the potential of deliberately designing a hierarchical structure within CANs networks, and our understanding of how this approach impacts material properties remains quite limited.

In this project, we propose using a dormant difunctional crosslinker which can only become active when triggered with an stimuli such as UV. Using this crosslinker to form dynamic bonds within a block copolymer system after its self-assembly into ordered structures (for example a lamella) could lead to a CANs with significant improvement in mechanical properties such as **creep resistancy** compared to a CANs with same component but without ordered phase-separated structure. *(Protocols to synthesize the protected crosslinker and copolymer have been already established within the research group)*



Research topics

There are several possible research topics within this project, such as:

- Synthesis and characterization of different variants of protected crosslinker (aliphatic or aromatic) and also diblock copolymer (different block ratios);
- Characterization of dynamic networks containing different amounts of polymer to crosslinker ratio;
- Morphological studies of phase-separated copolymer through techniques such as AFM, TEM, SAXS (if time is available).
- Recyclability studies

Techniques to be used

In this project a number of different techniques are used to study the materials. Examples of these techniques are:

- Organic/polymer synthesis
- NMR/GPC
- FT-IR
- Rheology
- DMA

More information

Maarten Smulders, room Helix 8.057, e-mail: maarten.smulders@wur.nl.