Group : Dynamic Polymers
Project : **Smart Materials – Dynamic Diels-Alder Polymers**
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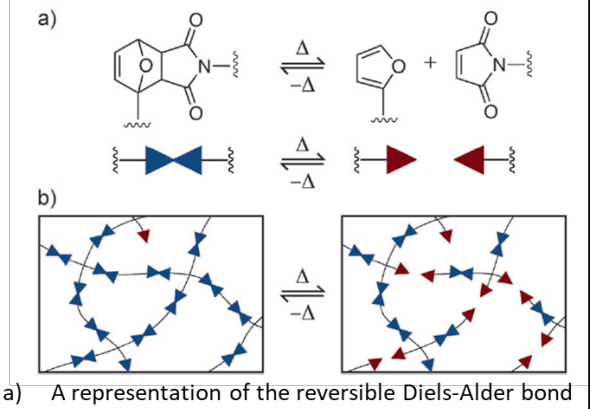
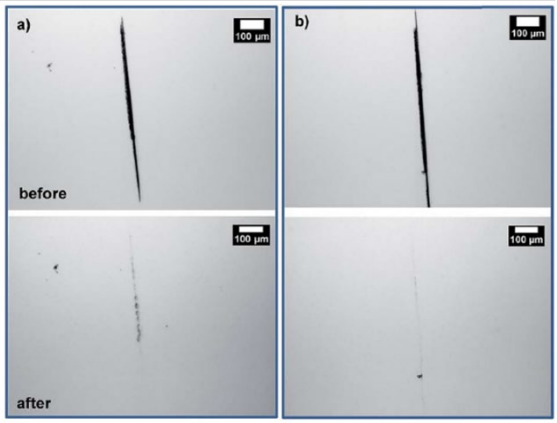
Introduction

In this project we try to develop *smart materials* using reversible covalent chemistry. Reversible or dynamic covalent chemistry consists of covalent bonds that can attach and detach under certain stimuli. This dynamic equilibrium can be controlled with different bond specific stimuli, such as heat or light. By using reversible dynamic covalent bonds in networks, the resulting material can have interesting properties, such as reshaping of the material, improved recycling or self-healing behaviour.



a) A representation of the reversible Diels-Alder bond
b) A scheme depicting a dynamic network.[1]



A scratched self-healing Diels-Alder material before and after thermal treatment[2]

Here we integrate the dynamic *Diels-Alder* reaction between furan and maleimide to make *covalent adaptable networks (CANs)*. The properties of these networks can then be controlled, due to the temperature dependent equilibrium of the *Diels-Alder* reaction.

Research topics

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

- Synthesis and characterisation of bismaleimide crosslinkers;
- Synthesis and characterisation of furan containing polymers;
- Characterisation of dynamic Diels-Alder networks;
- Study of the polymer's 'smart' properties, such as recyclability or self-healing ability.

Techniques to be used

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

- NMR
- GPC
- Rheology

More information

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References

1. Bowman, C.N. and C.J. Kloxin, *Angew. Chem. Int. Ed.*, **2012**, *51*(18), 4272-4274.
2. Jung, S., *et al.*, *RSC Advances*, **2017**, *7*(42), 26496-26506.