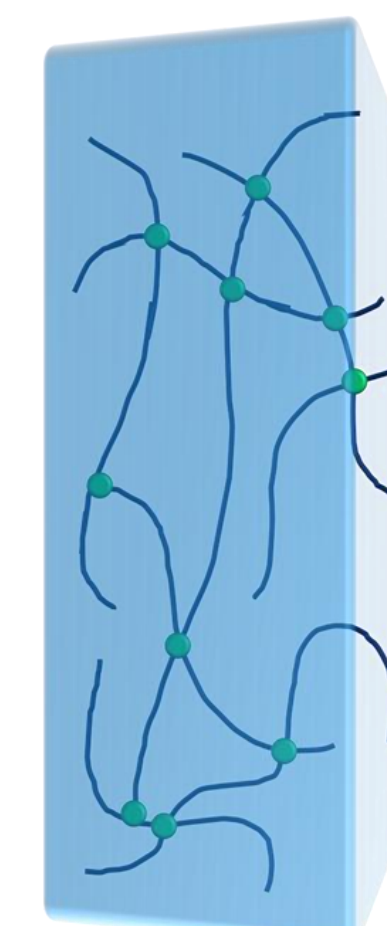
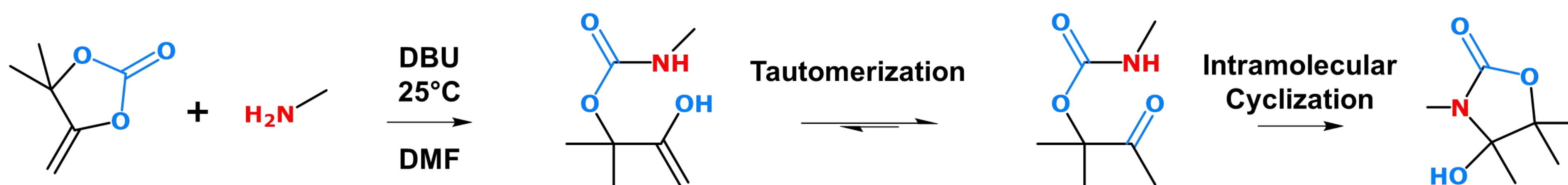


## INTRODUCTION

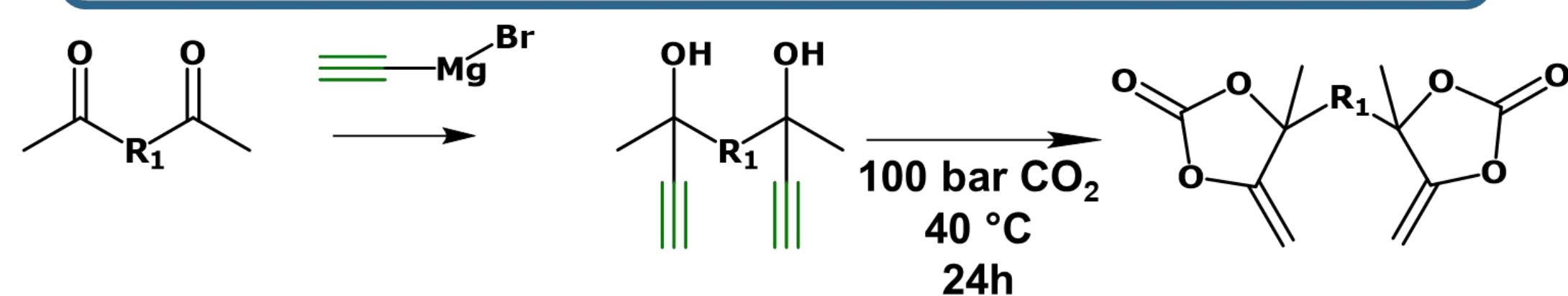
In order to address the need of a replacement for traditional polyurethane formulation, Non-Isocyanate Polyurethane (NIPU) are the subject of an increasing number of studies<sup>1,2</sup>. Here, we investigated a promising strategy consisting in the reaction between commercially available polyamines and various carbon dioxide-sourced bis-cyclic carbonates (bis-CC) previously developed at the CERM<sup>3</sup>. More specifically, the aim of this work was to develop a robust formulation method adaptable to various compositions of the desired material in order to rapidly and efficiently produce a wide array of networks differentiated by their mechanical properties.

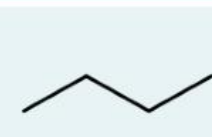
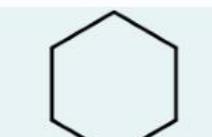
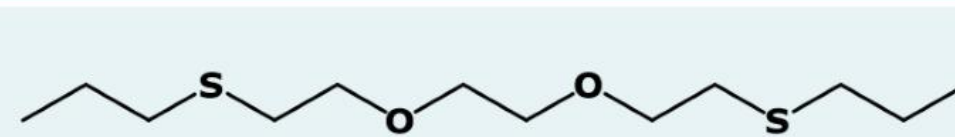
## EXPERIMENTAL SECTION

### HYDROXY-OXAZOLIDONE FORMATION

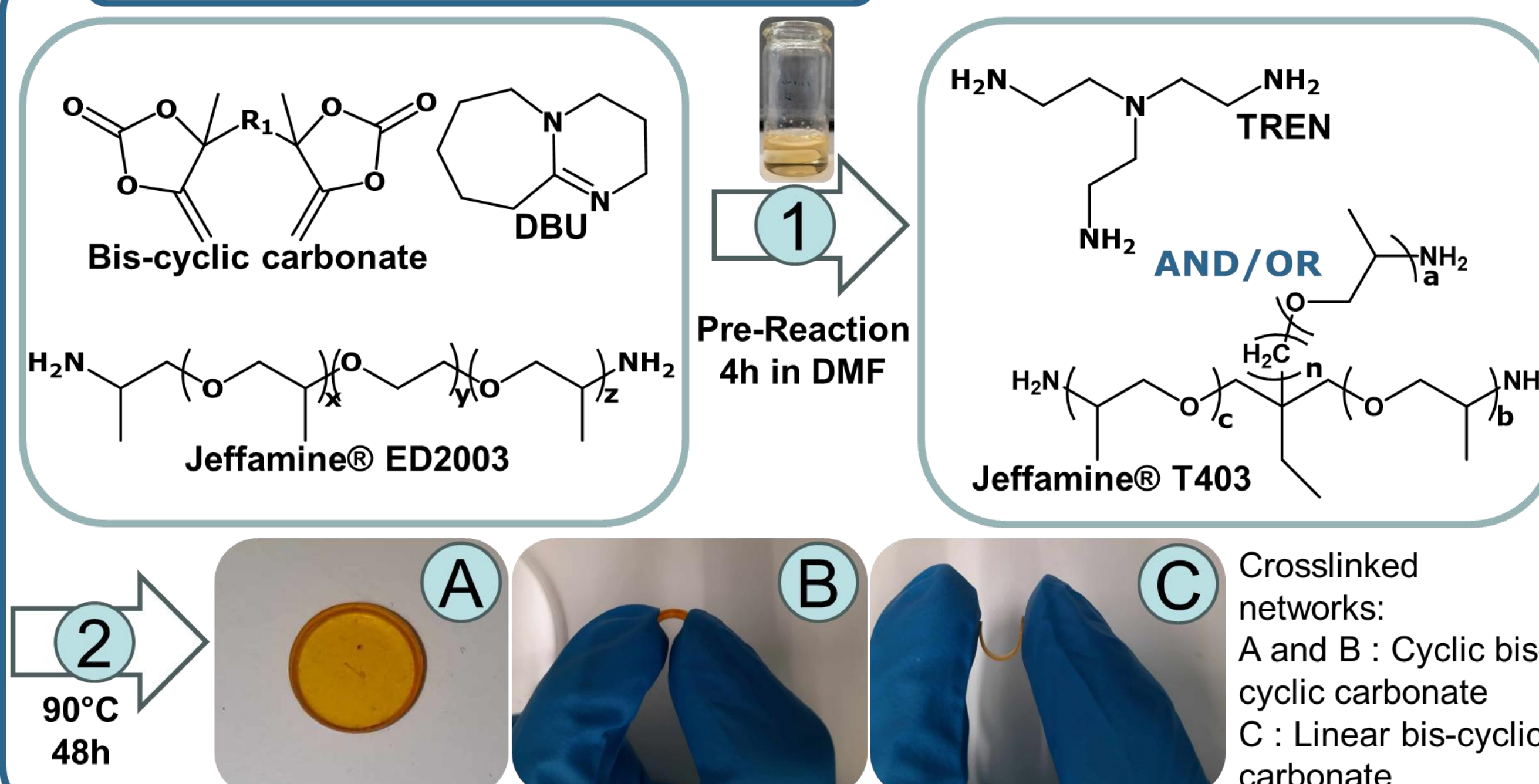


### α-ALKYLIDENE BIS-CYCLIC CARBONATES

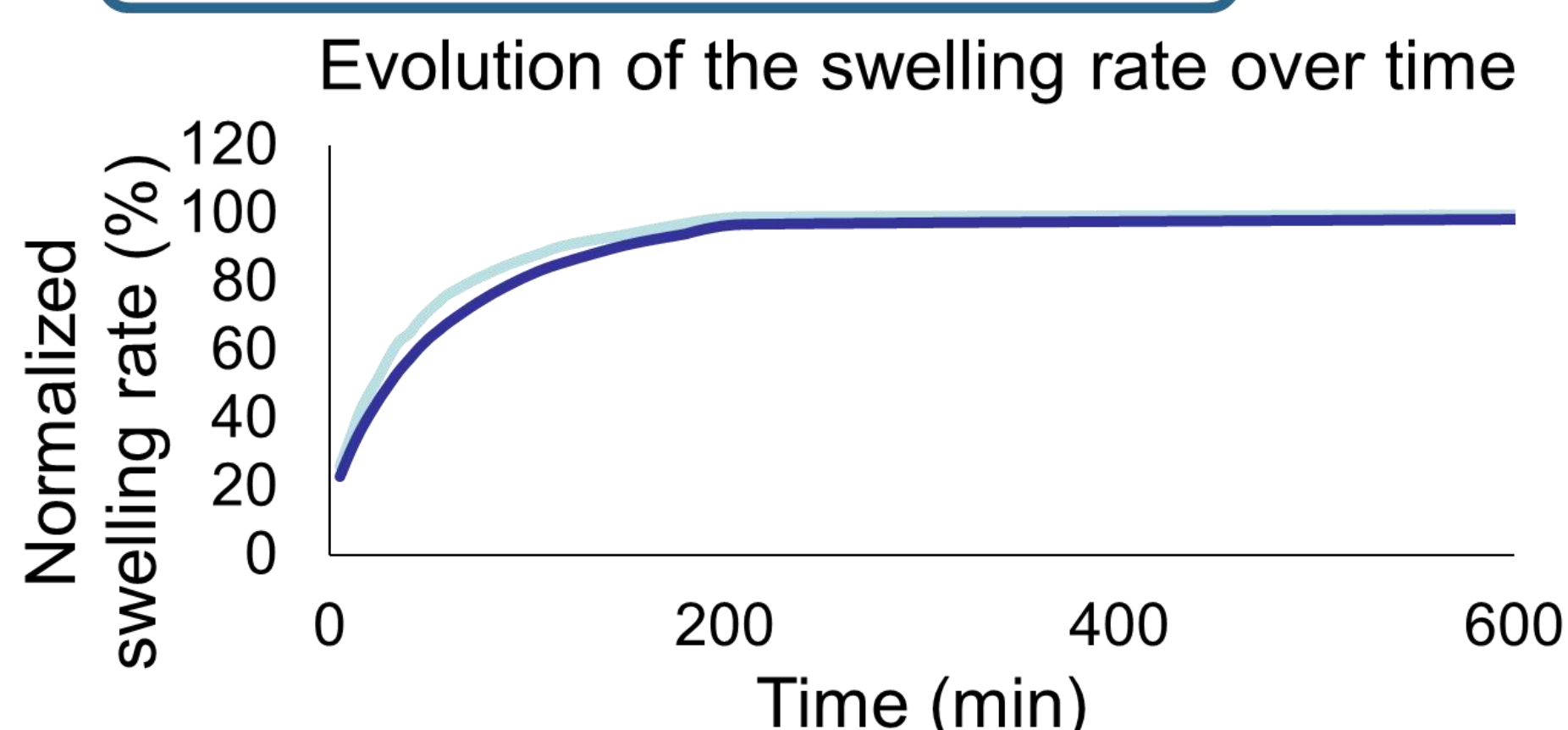


R <sub>1</sub>		
		
<b>Linear bis-cyclic carbonate</b>	<b>Cyclic bis-cyclic carbonate</b>	<b>Ethoxy bis-cyclic carbonate</b>
<ul style="list-style-type: none"> <li>Flexible bis-cyclic carbonate</li> <li>Soluble in DMF</li> </ul>	<ul style="list-style-type: none"> <li>Rigid bis-cyclic carbonate</li> <li>Less soluble in DMF</li> </ul>	<ul style="list-style-type: none"> <li>Liquid at room temperature</li> <li>Compatible with solvent-free formulation</li> </ul>

### HYDROGEL FORMULATION

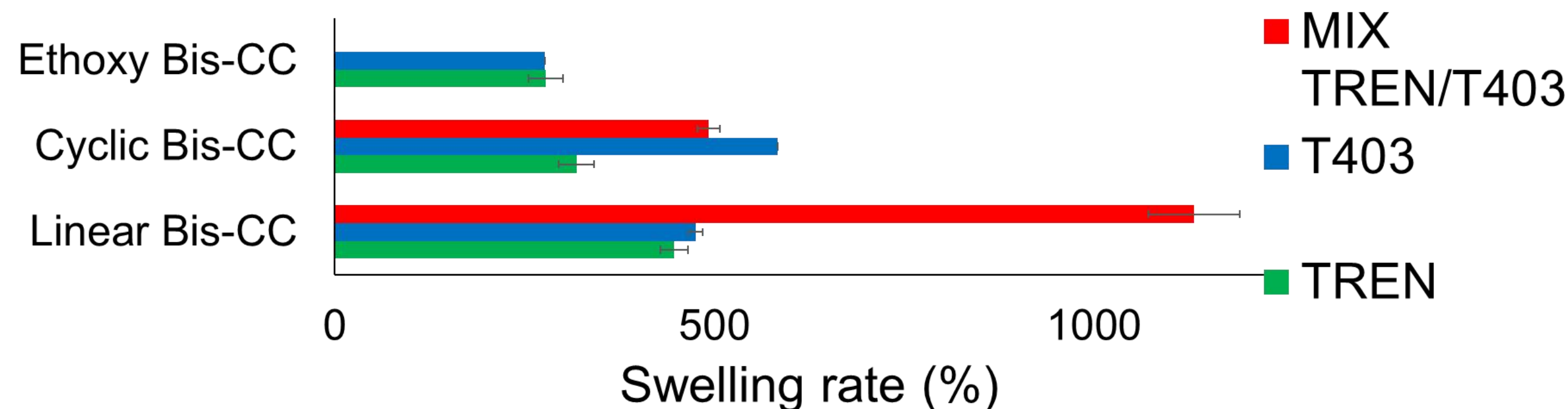


### SWELLING RATE IN WATER



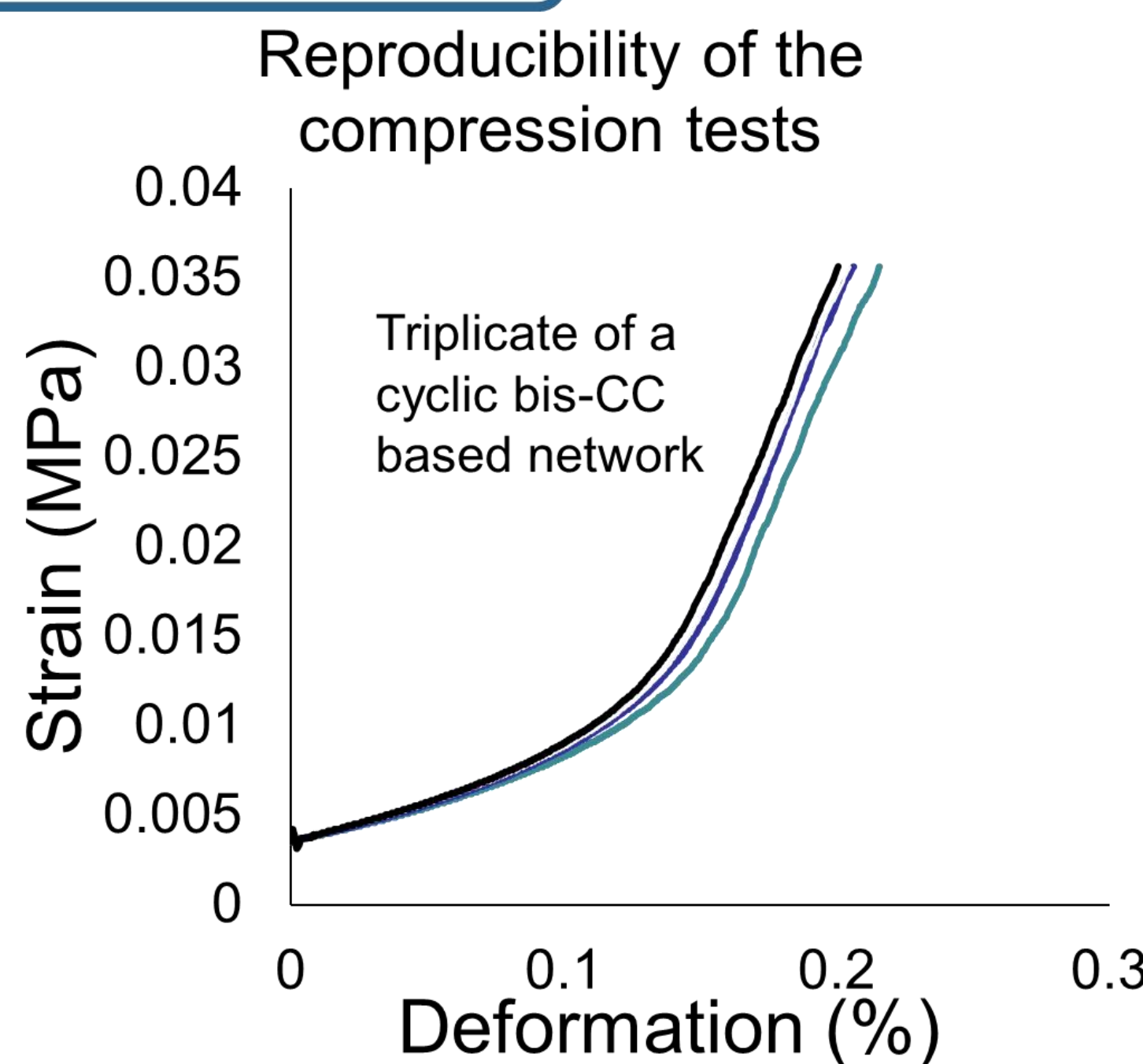
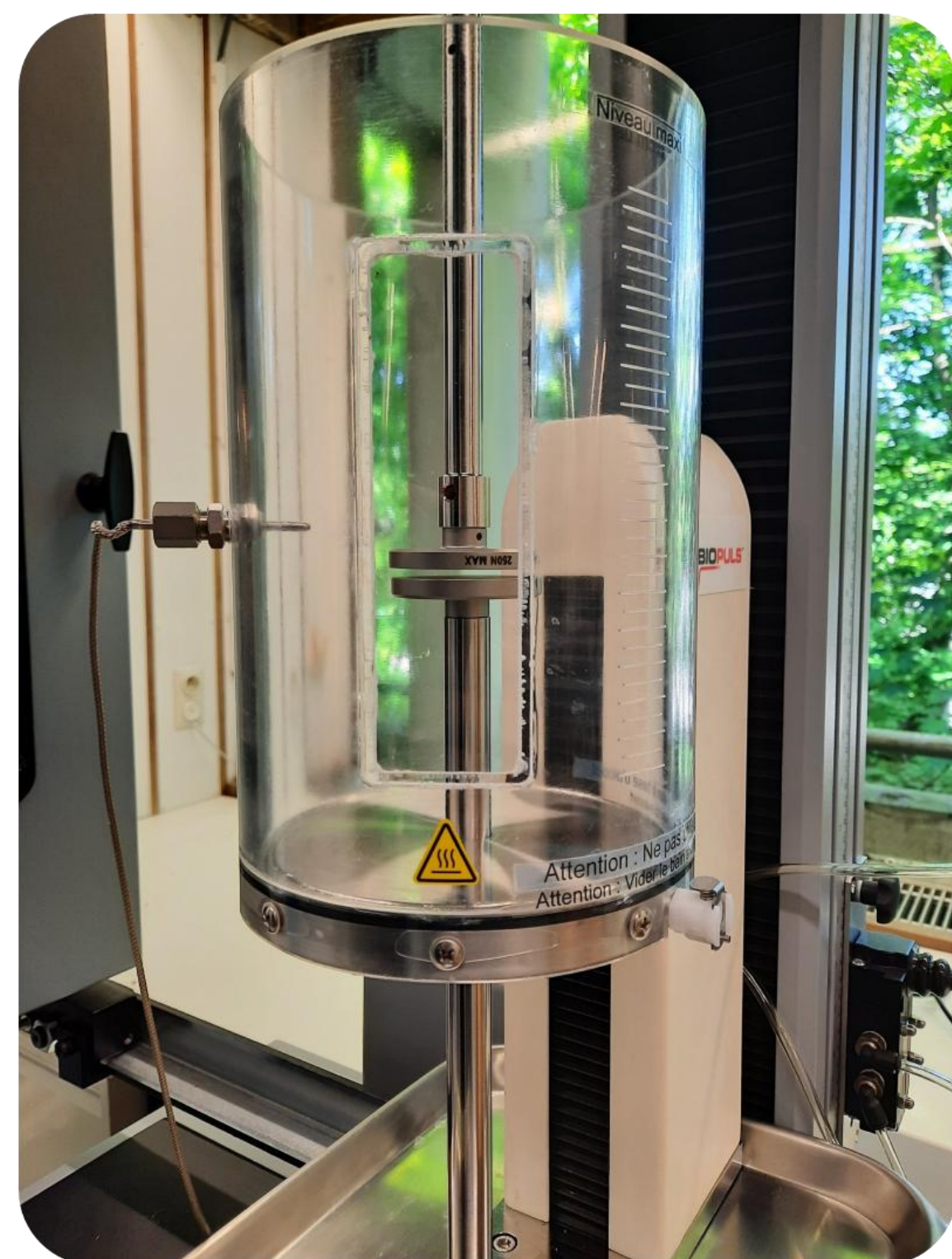
The time to reach the maximum swelling rate is independent from the composition of the networks

Swelling rate in Ultrapure® water as function of the network formulation

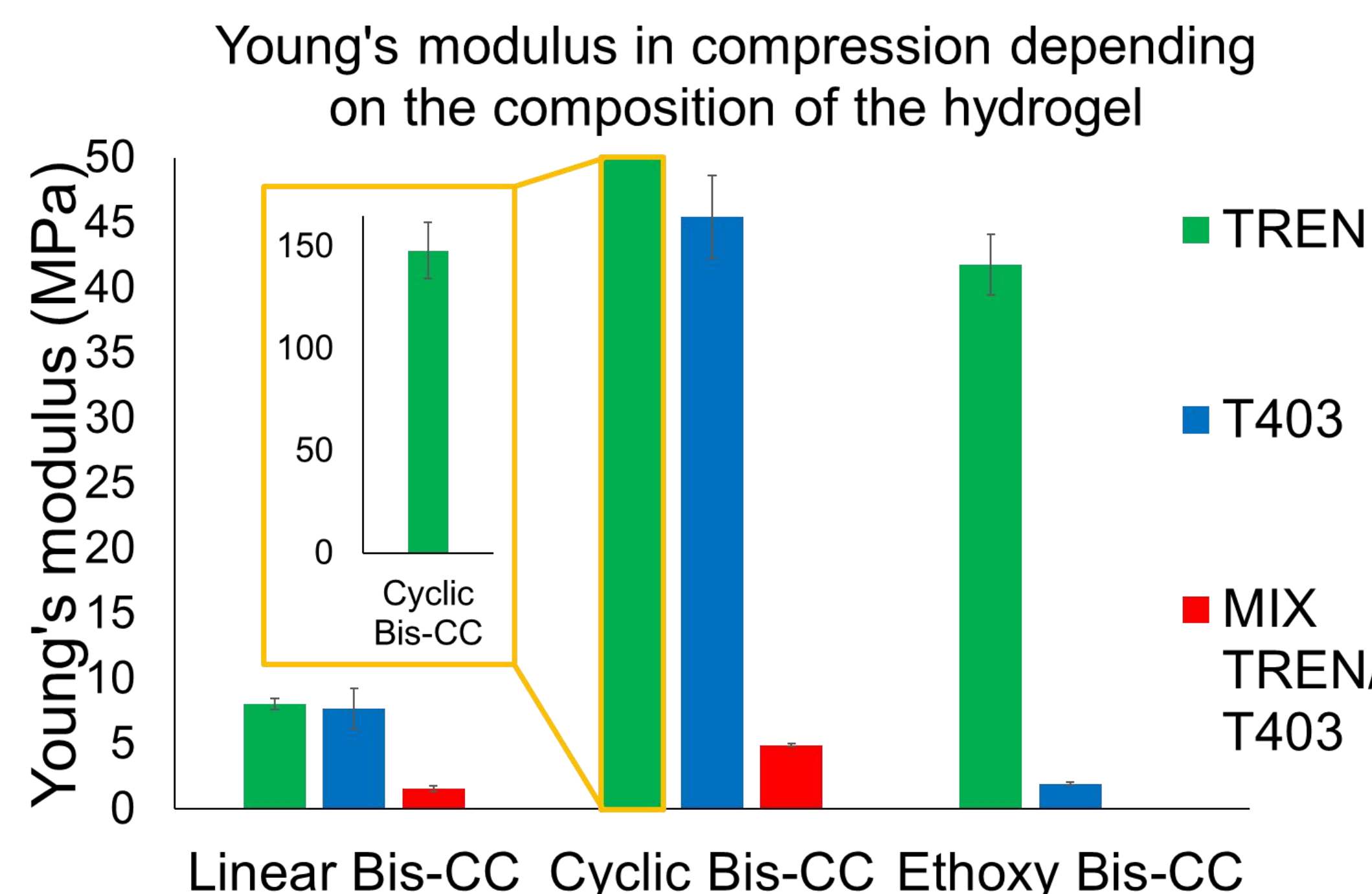


The impact of the crosslinking agent on the swelling rate highly depends on the nature of the used bis-cyclic carbonate

### YOUNG'S MODULUS IN COMPRESSION



The test conditions allow for highly reproducible experiments



The sensibility of the variation caused by the modification of the crosslinking agent is function of the nature of the used bis-CC

## CONCLUSION

- ▶ Wide range of mechanical properties based on the composition of the network
- ▶ Robust and adaptable formulation process

## PERSPECTIVES

- ▶ Optimization of the solvent-free formulation
- ▶ Investigation on the mix of crosslinking agents
- ▶ Stability tests at various pH

## REFERENCES

- [1] Delavarde, A. *et al*; *Prog. Polym. Sci.* **2024**, vol. 151, p. 101805, [2] Rokicki, G. *et al*; *Polym. Adv. Technol.* **2015**, vol. 26, no. 7, pp. 707-761, [3] Gennen, S. *et al*; *Angew. Chem. Int. Ed.* **2017**, vol. 56, no. 35, pp. 10394-10398

