Tie, pull, release: forcing polymers into (re)action

Guillaume De Bo
Department of Chemistry, University of Manchester, Oxford Road, M13 9PL, Manchester, UK
e-mail: guillaume.debo@manchester.ac.uk
website : www.deboresearchgroup.com

Mechanical force is a formidable, and relatively unexplored, source of energy that, with its ability to distort, bend and stretch chemical bonds, is unique in the way it activates chemical reactions. The precise control of this force could revolutionise how we build and rearrange molecules and change the way we think about chemical transformations. Pulling both ends of a macromolecule apart creates highly directional strain with its highest intensity in the middle of the chain and, in polymer mechanochemistry, the force is transduced to force-sensitive moieties (mechanophores) embedded within the polymeric backbone. Here we use high-intensity ultrasound to activate mechanophores in solution, and show how geometry, topology, and substitution can be used to control the mechanical activity of a mechanophore.[1-7]

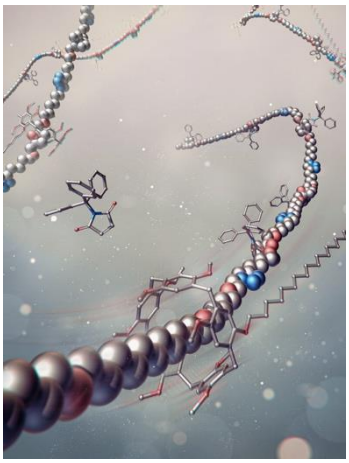

Figure 1. *Force-controlled release of small molecules with a rotaxane actuator.*[1]

Bio

Guillaume is Professor of Organic Chemistry at the University of Manchester. He graduated from the University of Louvain (MSc 2004, and PhD 2009), and started his independent career in 2016 under the impulse of a prestigious Royal Society University Research Fellowship (2016-2023).

His work aims at controlling the reactivity of molecules under tension for application in synthetic chemistry, materials, and biology. He is the recipient of several awards including the 2021 Bob Hay Lectureship and the 2025 ACS Macro Letters/Biomacromolecules/Macromolecules Young Investigator Award. He was awarded an ERC Consolidator grant in 2022.

Selected recent publications

(1) Wu, M.; De Bo, G. *Angew. Chem. Int. Ed.* **2025**, e202501499.
(2) Chen, L.; Nixon, R.; De Bo, G. *Nature* **2024**, *628*, 320.
(3) Zhang, M. et al. *Nat. Chem.* **2024**, *16*, 1366.
(4) Cheng, Q.; De Bo, G. *Chem. Sci.* **2024**, *15*, 13181.
(5) Suwada, K.; Ieong, A. W.; Lo, H. L. H.; De Bo, G. *J. Am. Chem. Soc.* **2023**, *145*, 20782.
(6) Nixon, R.; De Bo, G. *J. Am. Chem. Soc.* **2021**, *143*, 3033.
(7) Nixon, R.; De Bo, G. *Nat. Chem.* **2020**, *12*, 826.