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## Thermoresponsive polymers and host-guest chemistry: a win-win combination

Cedric Ribeiro,<sup>a</sup> Hui Guo,<sup>b</sup> Lieselot De Smet,<sup>a,d</sup> Khaled Belal,<sup>a</sup> Aurélien Vebr,<sup>a,d</sup> Aurelie Malfait,<sup>a</sup> Gaelle Le Fer,<sup>a</sup> Joel Lyskawa,<sup>a</sup> Jonathan Potier,<sup>a</sup> Dominique Hourdet,<sup>b</sup> François Stoffelbach,<sup>c</sup> Alba Marcellan,<sup>b</sup> Richard Hoogenboom,<sup>d</sup> Patrice Woisel<sup>a,\*</sup>

<sup>a</sup> Univ. Lille, CNRS, Centrale Lille, INRAE, UMR 8207 - UMET - Unité Matériaux Et Transformations

<sup>b</sup> Soft Matter Sciences and Engineering, ESPCI Paris, PSL University, Sorbonne University

<sup>c</sup> Sorbonne Université, CNRS, Institut Parisien de Chimie Moléculaire, UMR 8232, Equipe Chimie des Polymères

<sup>d</sup> Supramolecular Chemistry Group, Centre of Macromolecular Chemistry (CMaC), Ghent University

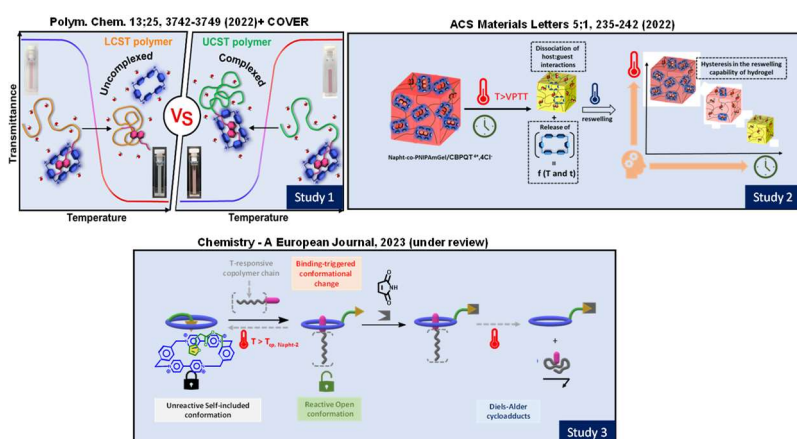
\* [Patrice.woisel@centrailelille.fr](mailto:Patrice.woisel@centrailelille.fr)

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### Abstract:

The combination of heat-sensitive polymers and supramolecular chemistry has recently led to the development of fascinating adaptive materials. In this context, most studies have focused on exploiting host-guest interactions to control the physicochemical properties of polymeric materials.<sup>1</sup> This approach has notably enabled the creation of materials with programmable thermosensitivity and sensor properties.<sup>2</sup> In contrast, the exploitation of polymer thermoresponsiveness to control the recognition properties of host-guest systems at the molecular level is much less developed, and a perfect understanding of the mechanisms triggering thermo-induced decomplexation or complexation is still elusive.

In this communication, we will illustrate through three studies how the host-guest chemistry and the thermo-induced phase separation mechanisms can “talk together” to synergistically tune the coil↔globule transition and the complexation state of polymeric systems. The first example<sup>3</sup> concerns a comparative analysis of the behaviour of complexes formed from different naphthalene end-functionalized LCST or UCST polymers and the electron-deficient cyclobis(paraquat-p-phenylene) tetrachloride (**CBPQT**<sup>4+</sup>, **4Cl**)<sup>3</sup> host when subjected to heat treatment. This study provided an understanding of the mechanisms triggering the thermo-induced (de)complexation of such complexes. The second study reports a supramolecular approach for developing an intelligent thermoresponsive polymeric hydrogel featuring a



dual temperature and time memory function based on a kinetic control of the material's (de)complexation and (re) swelling behaviours. The last study illustrates how a thermo-induced phase separation mechanism can regulate on demand the Diels-alder reactivity of a synthetic self-complexing host-guest molecular switch **CBPQT**<sup>4+</sup>-**Fu**, consisting of an electron-rich furan unit covalently attached to the electron-deficient **CBPQT**<sup>4+</sup> host, with maleimide in water. Thanks to a supramolecular

control over the topology of **CBPQT**<sup>4+</sup>-**Fu** combined with a thermoresponsive supramolecular regulator, we reported a rare example of decreased reactivity upon increasing temperature.

### References :

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