**Smart Stimuli-Responsive Materials Driven by Rotaxane Molecular Switch**

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Syntheses and functions of novel stimuli-responsive materials are discussed, following the brief introduction of other works achieved so far in supramolecular, organic, and polymer chemistry fields in our laboratory.

One of the most fascinating functions of polymers seems dynamic function caused by hierarchically changeable polymers as stimuli-responsive polymers which enable to enhance small structural change to bulk property change. In particular, we would like to emphasize stimulus-induced transformation of polymer topology as potential function rising in new era of polymer science, since polymer property largely depends on the polymer topology. In the present talk, we discuss mainly on the polymer topology change from linear to cyclic or from linear to star shape along with the accompanying property change. These topology changes are driven by rotaxane molecular and macromolecular switches, *i.e.* most reliable switch systems, where simple chemical reaction causes small partial polymer structural change which is gradually amplified to polymer shape or topology change, polymer assembly or morphology change, and finally polymer property change. From view point of practical use, we may also discuss on the development of polymer materials extraordinarily toughened by cross-linking with rotaxane cross-linkers which prove mobility of polymer chains at the cross-link points.

*Related Papers:*

1. Review: D. Aoki, T. Takata, *Polymer* **2017**, *128*, 276 ~ 296.

2. Review: T. Takata, D. Aoki, *Polym. J.* **2018**, *50*, 127 ~ 147.

3. D. Aoki, S. Uchida, T. Takata, *ACS Macro Lett.* **2014**, *3*, 324 ~ 328.

4. D. Aoki, S. Uchida, T. Takata, *Angew. Chem. Int. Ed.* **2015**, *54*, 6770 ~ 6774.

5. D. Aoki, S. Uchida, H. Marubayashi, S. Nojima, T. Takata, *Angew. Chem. Int. Ed.* **2016**, *55*, 2778 ~ 2781.

6. D. Aoki, G. Aibara, S. Uchida, T. Takata, *J. Am. Chem. Soc.* **2017**, *139*, 6195 ~ 6199.

7. T. Kureha, D. Aoki, S. Hiroshige, K. Iijima, D. Aoki,T. Takata, D. Suzuki, *Angew. Chem. Int. Ed.* **2017**, *56*, 15393 ~ 15396.