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OEGylated dendronized polymers for stimuli-responsive materials

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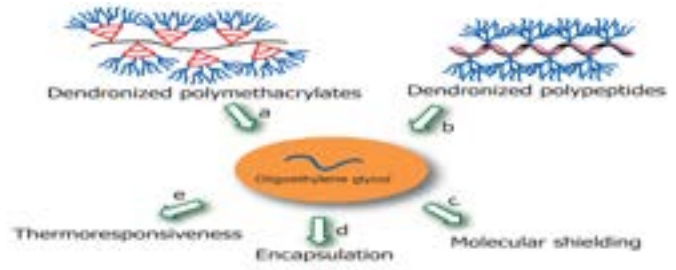
Dendronized polymers are formed through densely attaching dendrons along a linear polymer main chain, which adopt cylindrical wormlike morphology with tunable thickness. Inspired from the smart properties of biomacromolecules in nature, an intriguing class of stimuli-responsive dendronized polymers were constructed through combination of dendritic oligoethylene glycols (OEG) with various kinds of polymer backbones. Due to the densely covered OEG pendants, these macromolecules show unprecedented thermoresponsiveness and excellent biocompatibility. This presentation will discuss our findings in developing versatile thermoresponsive warm-like dendronized polymethacrylates and polypeptides by decorating with dendritic OEG pendants through covalent linkages, dynamic covalent linkages or supramolecular interactions. Depending mainly on the molecular topology, amphiphilic structure in these dendronized polymers plays different roles on mediating their stimuli-responsive properties. Based on the thickness effects, dendronized polymers undergo heterogeneous dehydration and collapse on individual molecular level. Therefore, guest molecules can be encapsulated and released based on the phase transition temperature, heating rate and thickness of the polymers, resulting in interestingly the formation of molecular containers. This encapsulation property affords these thick polymers tunable shielding ability to protonation and metal coordination in aqueous solutions. In a word, combination of unique thermoresponsive behavior, reversible encapsulation and switchable shielding to guests, protonation as well as metal coordination from these OEGylated dendronized polymers may lead to their promising applications in biomaterials, including drug delivery and targeting, enzyme activity control and transportation.



Recent Publications

1. **Li W et al. (2008) Thermoresponsive dendronized polymers. Macromolecules. 41(10):3659-3667.**
2. **Junk M J N et al. (2010) EPR spectroscopic characterization of local nanoscopic heterogeneities during the thermal collapse of thermoresponsive dendronized polymers. Angew. Chem. Int. Ed. 49(33):5683-5687.**
3. **Liu L et al. (2011) Comblike thermoresponsive polymers with sharp transitions: synthesis, characterization, and their use as sensitive colorimetric sensors. Macromolecules. 44(21):8614-8621.**
4. **Yan J, Li W and Zhang A (2014) Dendronized supramolecular polymers. Chem. Commun. 50(82):12221-12233.**
5. **Yan J et al. (2016) Thermoresponsive dendronized polypeptides showing switchable recognition to catechols. Macromolecules. 49(2):510-517.**

Biography

Afang Zhang is a Polymer Chemist. His research interest comprises dendronized polymers, supramolecular polymers, helical polymers, as well as polymers with switchable properties. He began his research work from 1988 at Chemistry Institute of Henan. After three years working at German Plastics Institute and Free University of Berlin, he joined Zhengzhou University as Distinguished Professor. From 2005, he started working in ETH Zurich as Senior Scientist. By the end of 2009, he returned to China and joined Shanghai University as Distinguished Professor. Thereafter, he became a 1000-plan Scholar affiliated to Shanghai Government. From 2017, he was offered a title of honor professor by the University of Queensland. He has hosted more than 40 projects from Chinese and Swiss Governments and received more than 10 Science And Technology Awards from Chinese Governments. He has published more than 120 journal papers and is the Inventor for more than 20 patents.

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