Dynamic covalent polymer networks: new opportunities with old chemistry

Tao Xie ...

College of Chemical and Biological Engineering,
State Key Laboratory of Chemical Engineering
Zhejiang University, Hangzhou, P. R. China
E-mail: taoxie@zju.edu.cn

Dynamic covalent polymer networks offer unusual opportunities beyond classical thermoplastic and thermoset polymers, most notably self-healing and thermoset recycling. In the last five years, my group has been working on the use of readily accessible covalent bonds (ester, urethane, urea etc) to design functional polymer networks with dynamic characteristics. In this talk, I will illustrate how these industrially relevant covalent bonds (old chemistry) can broaden the design of functional polymer networks beyond self-healing and recycling. Specifically, I will demonstrate how the general principle of dynamic bond exchange can be applied to program a diverse set of polymer attributes including shape, actuation, stress, and physical properties. The versatility to program polymers can potentially impact many engineering applications including 3D/4D printing, flexible electronics, soft robotics, and medical devices.

Bio

Tao Xie is Qiushi chair professor at the College of Chemical & Biological Engineering, Zhejiang University. He obtained his BS and MS degrees in Polymer Chemistry from Zhejiang University in 1993 and 1996, respectively. From University of Massachusetts at Amherst, he received his Ph. D in Polymer Science & Engineering in 2001. He had since worked at the General Motors Global Research Lab and HRL Laboratories before returning to China in 2013. His current research interests include dynamic covalent polymer networks, shape memory polymers, and 3D/4D printing. He is the inventor of over 80 patent and a recipient of Omnova Solution award (2001), R&D 100 award (2013), and Wang Baoren Award (2019, Chinese Chemical Society). He is an elected fellow of ACS PMSE division and currently serves as an Associate Editor for ACS Applied Materials & Interfaces.