

Self-repairing transparent coatings

Kanyarat Mantala, Jenpob Sokjorhor, Tiwa Yimyai, and Daniel Crespy*

Department of Materials Science and Engineering, Vidyasirimedhi Institute of Science and Technology (VISTEC), Rayong 21210, Thailand

Self-healing materials have the ability to restore their properties, typically mechanical properties, after being damaged. Polymer materials with self-healing ability have found applications as coatings for anticorrosion [1-2] and as matrix for self-repairable sensors [3]. Herein, we discuss methods to prepare transparent polyurethanes which can heal at room temperature [4]. Coatings formed with these polymers were able to fully recover their transparency after scratching due to the presence of dynamic disulfide bonds in their macromolecular structures. Additionally, because most synthesis of self-healing polyurethanes is carried out in organic solvents, we introduce a new method to prepare such polymers in water [5]. The method relies on the synthesis of polyurethane chains capped with thiosulfate groups, forming organothiosulfates (also called Bunte salts), which provide amphiphilicity and hence dispersibility in water. The thiosulfate groups are hydrolyzed to yield thiol groups, which are then oxidized to form dynamic disulfide bonds, enabling efficient self-healing of the polymers at room temperature.

daniel.crespy@vistec.ac.th

References

- [1] Yimyai, T.; Crespy, D.; Rohwerder, M. *Adv. Mater.* **2023**, 35, 2300101
- [2] Sokjorhor, J.; Phantan, C.; Ratanathawornkit, K.; Crespy, D. *Adv. Funct. Mater.* **2025**, 2508274
- [3] Yimyai, T.; Crespy, D.; Pena-Francesch, A. *Adv. Funct. Mater.* **2023**, 33, 2213717
- [4] Mantala, K.; Crespy, D. *Macromolecules* **2023**, 56, 7332
- [5] Mantala, K.; Crespy, D. *Macromolecules* **2025**, 58, 3450