Supramolecular Repair of Hydration Lubrication Surfaces

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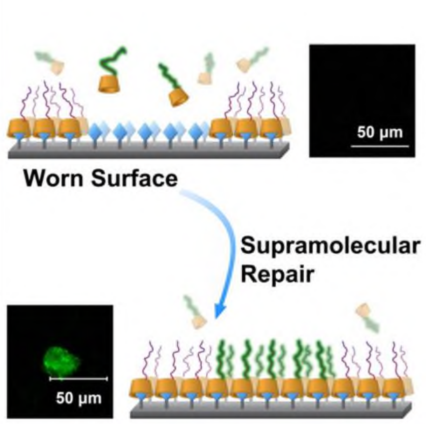
Friction between contacting surfaces reduces energy efficiency and causes irreversible damage, leading to an estimated 20% of global energy consumption. Natural systems minimize friction by (1) exploiting surfaces that attract a lubricating layer of water molecules and (2) replenishing surfaces as they become worn. We have recently outlined a strategy to obtain synthetic coatings that exhibit both of these desirable characteristics (see *Chem* **2022**, *8*, 480). We have made use of selective supramolecular interactions to dynamically assemble a lubricating polymer on a surface. These attractive interactions restore the lubricating surface in situ following periods of mechanical wear. This "supramolecular repair" concept could be expanded upon using diverse recognition motifs, surface chemistries, or polymer structures to achieve low-friction coatings. Such coatings may enhance the lifetimes and the efficiencies of articulating components in biomedical and mechanical systems.



In this project, the student will extend our understanding of this phenomenon and develop systems that function at the interfaces of soft materials (going beyond the hard metal alloy and glass substrates investigated previously) and employ different molecular recognition motifs. The project will involve synthetic chemistry to prepare and modify polymers, macrocycles and functionalised surfaces, as well as the use of microscopy to study friction properties.