YOSHIE LAB.

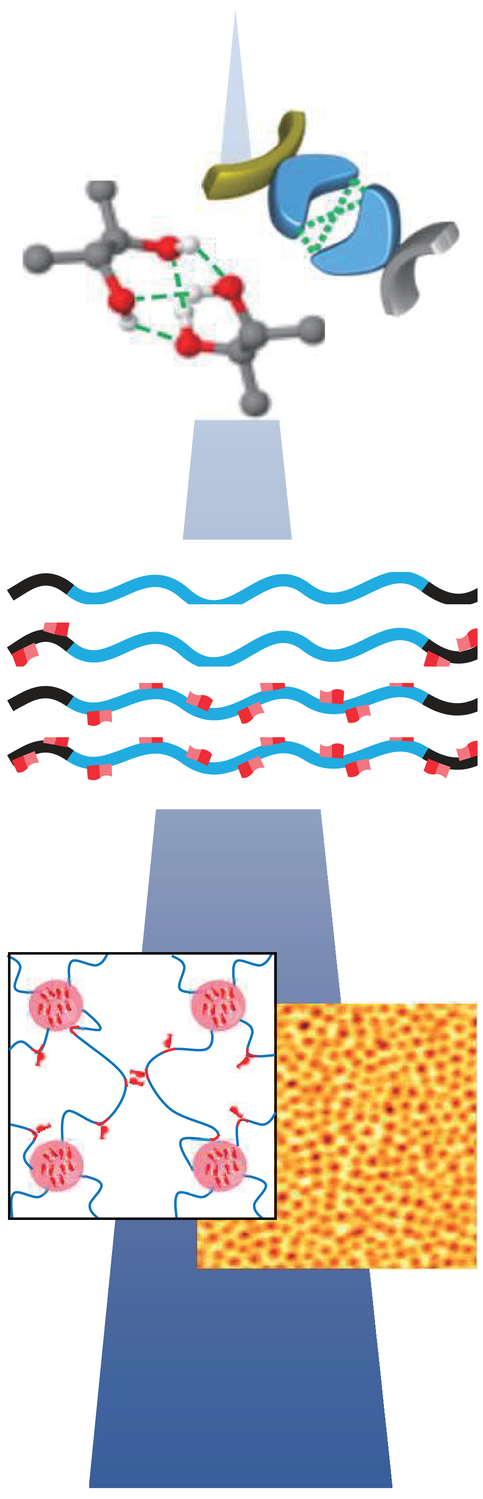
Creating high performance & environmentally conscious polymers

Department of Materials and Environmental Science

Polymeric and Environmentally Conscious Materials
Department of Chemistry & Biotechnology, Graduate School of Engineering
http://yoshielab.iis.u-tokyo.ac.jp/

With a focus on **dynamic control** of **hierarchical structures** from molecular structure to higher-order structure, we are designing polymers with **dynamic bonds** (DBs). Through this process, we are creating various **functional materials** that contribute to a **sustainable society**, such as materials with **toughness** and **fatigue recoverability**, and materials that **biodegrade** in the natural environment.

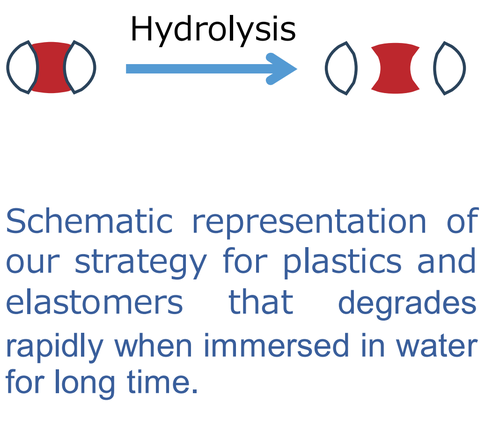
Space Smaller
Time Shorter



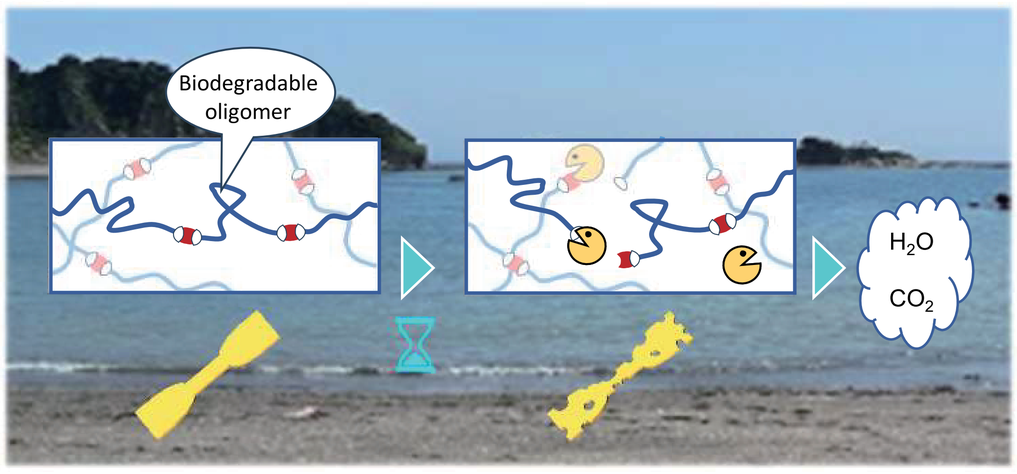
Space Larger
Time Longer

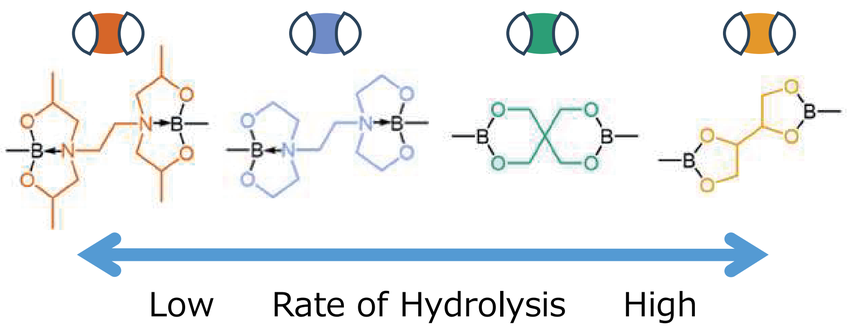
Biodegradable polymers using water-sensitive dynamic bonds

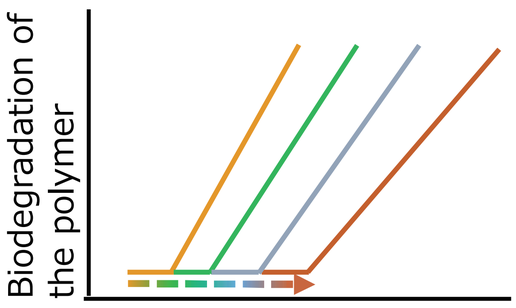
The environmental impact of waste polymer materials has become a social problem, and there is a demand for polymers that degrade in the natural environment. We are developing rubbers and plastics that maintain sufficient toughness during use but decompose rapidly when left in aquatic environments such as oceans and rivers for long time.



Schematic representation of our strategy for plastics and elastomers that degrades rapidly when immersed in water for long time.



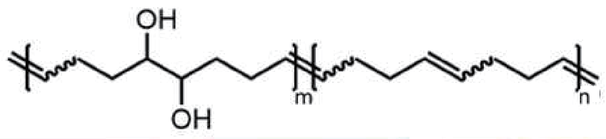


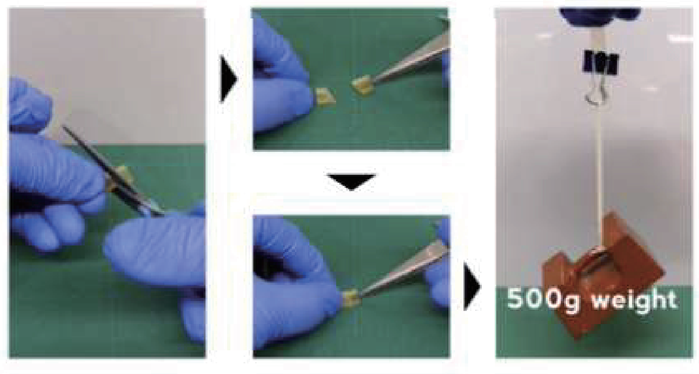


Control of the lag time until biodegradation for plarstics and elastomers

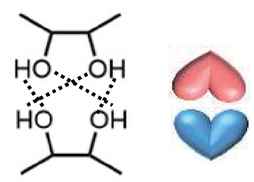
Polymer design with "soft" H-bonds

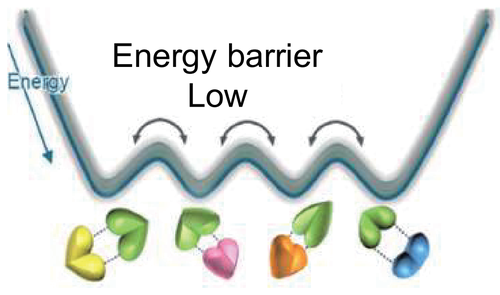
While hydroxyl groups are common functional groups, simply placing two of them next to each other allowed us to create self-healing rubber. Based on this research, we are now focusing on soft hydrogen bonding in our studies.





Self-healing elastomer with simple chemical structure





Conceptual diagram of “Soft” H-bonds