

***UNIVERSITY OF RHODE ISLAND***  
***Department of Chemistry Ph.D. Seminar***

***Room 105 Beupre***  
***2:00 P.M., Friday, April 22, 2022***

***Thomas Wright***  
***University of Rhode Island***  
***Department of Chemistry***

***“Exploring Equilibrium:  
Catalysts for the  
(De)Polymerization  
of Lactones”***

***HOST***

***Dugan Hayes***  
***Department of Chemistry***  
***401-874-5516***

# Exploring Equilibrium: Catalysts for the (De)Polymerization of Lactones

Thomas Wright  
Department of Chemistry  
University of Rhode Island

Plastics range in applications from biomedical implants to food or waste storage. As the breadth of application increases, so does the need for methods that yield precise materials, i.e., low dispersity and precise molecular weight. Typical (thio)urea catalysts yield great control but low reaction rates as compared to metal catalysts; however, rates have been shown to increase as the number of (thio)urea moieties on a catalyst are increased. Taking cues from previously developed tris-(thio)urea catalysts, a host of bis-(thio)ureas were synthesized. This study shows that the optimal bis-(thio)urea is that which allows for the greatest intramolecular activation of (thio)urea moieties. Increased intramolecular activation is afforded by modifying the tether, particularly by including heteroatoms.

Our catalysts are usually employed to form polymers, but by exploiting equilibrium in these reactions they may also be used to degrade polymers. Generally, methods for recycling polymeric waste include incineration or processes which slowly degrade the mechanical properties, beyond which the material is no longer commercially viable. Another recycling method, feedstock recycling, converts the polymer chains to smaller molecules. Feedstock recycling can be defined in two ways, additive and additive-free recycling. Here a new method of additive-free recycling (depolymerization) of polylactones is presented. Three polymers were used in this study: two yield monomer recovery between 85% and 90% via distillation from polymer melt, while the third polymer yields monomer recovery of 89% via sublimation of monomer from the polymer melt.