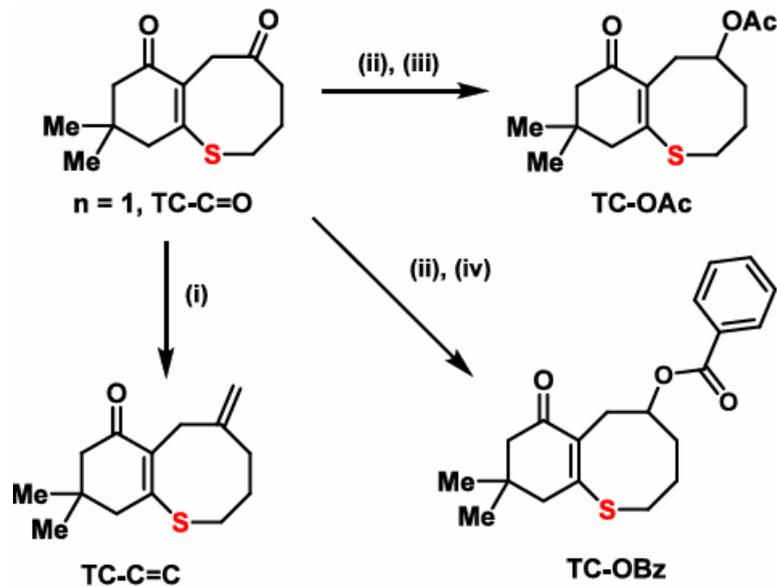


Michael Addition-Elimination Ring Opening Polymerization

YONG-LIANG SU, WEI XIONG, LIANG YUE, MCKINLEY K. PAUL, KAITLYN S. OTTE, JOHN BACSA, H. JERRY QI, AND WILL R. GUTEKUNST. *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY* 2024 146 (26), 18074-18082
 DOI: 10.1021/JACS.4C05054

Purpose

- Develop a method of **chain growth** polymerization using Michael addition/elimination ring opening of sulfur containing rings.
- Based on previous work of **step growth** polymerization of sulfur containing rings.

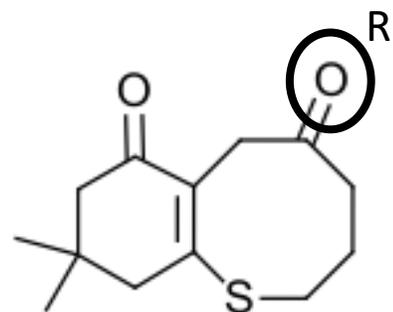


Developed monomers and specific reaction conditions that attained:

- ✓ Controllable reversibility and rate of polymerization
- ✓ Depolymerizability for recycling of monomers
- ✓ Easy to modify monomers
- ✓ Mild reaction conditions

General monomer structure

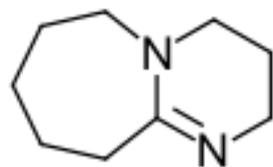
The Reaction



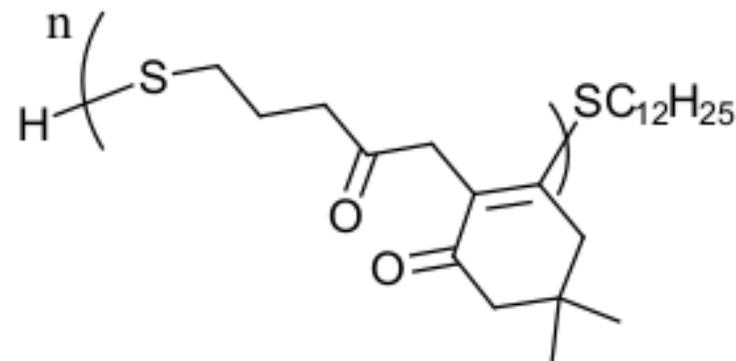
25 - 150 eq.

1eq. C₁₂H₂₅SH (initiator)
1eq. DBU (base)
1:1 mix THF:1,4 dioxane
room temp, N₂ atmosphere

Then Trifluoroacetic acid



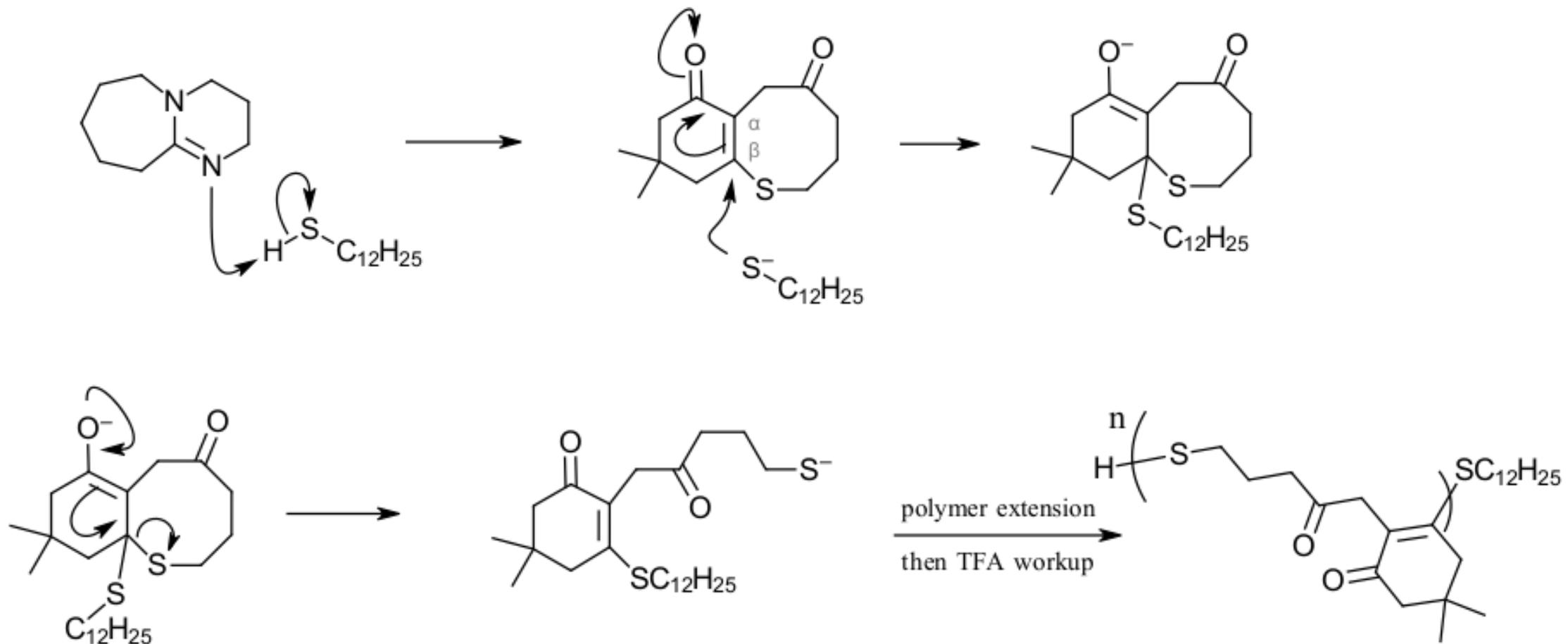
DBU



This is an example reaction, and the authors varied many reaction conditions over different runs, including:

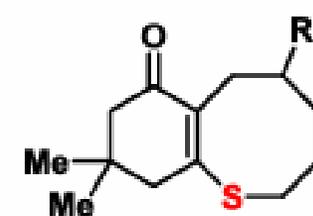
- Monomer R group
- Equivalents of monomer
- Different bases of varying strength
- Solvents of varying polarity

Mechanism Overview



Conclusion

- Many reactions were run with varying degrees of success
- Developed thiocane monomers are easy to synthesize and easy to modify



- Recyclable polythioenone polymers were made, which can have useful material properties

