

2007 Ohio Student Research Forum

Wright State University
Dayton, OH

RESEARCH ABSTRACT FORM

TITLE: Synthesis and Characterization of a Novel Series of Hetero-ligated Lanthanide Compounds for the Ring Opening Polymerization of ϵ -Caprolactone

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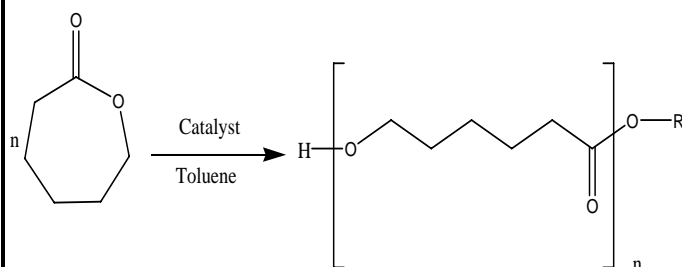
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INSTITUTION: Kent State University

Lanthanide complexes have been previously shown to serve as good catalysts for the polymerization of cyclic lactones.^{1,2} In this report, a series of lanthanide (La and Ce) compounds were synthesized and characterized. These compounds were prepared via the reaction of $\text{Ln}[\text{N}(\text{SiMe}_3)_2]_3$ with one and three equivalents of 1,1,3,3-tetramethylguanidine (H-TMG). These compounds were fully characterized through X-ray crystallography, and FT-IR Spectroscopy. Of these two families of compounds, the La series was examined as a catalyst for the ring opening polymerization of ϵ -caprolactone. In general, the polymerizations were performed by adding ϵ -caprolactone to a toluene solution containing the respective La catalyst. After the reaction was stirred for a minute, the resultant polymer was precipitated via the addition of methanol and then centrifuged. The polymer was then re-dissolved in tetrahydrofuran and placed in the freezer to crystallize. The resulting polymers were characterized and analyzed using ^1H NMR and ^{13}C NMR. The polymerizations were run at 75:1, 150:1 and at 300:1 ratios of monomer to catalyst. From the NMR spectra of the various catalysts, it was determined that the catalyst $[\text{La}\{\text{N}(\text{SiMe}_3)_2\}_2(\text{TMG})]$ (La 1:1) was the most active and made the longest polymer chain, and thus, formed the polymer of the highest average molecular mass. (See Table below)

References:

- (1) Grob, T.; Seybert, G.; Massa, W.; Weller, F.; Palaniswami, R.; Greiner, A.; Dehnicke, K. *Angewandte Chemie-International Edition* **2000**, 39, 4373.
- (2) Palard, I.; Soum, A.; Guillaume, S. M. *Chemistry-a European Journal* **2004**, 10, 4054.



Compound	Ratio Monomer: Catalyst	Average MW (g/mol)	Time (min)
$[\text{La}\{\text{N}(\text{SiMe}_3)_2\}_3]$	75:1	2,623	1
La 3:1	75:1	3,763	1
La 1:1	75:1	43,891	1