

## Ph.D. Research Colloquium (Seminar-II)

### Controlled synthesis of biodegradable polymers: efficient synthetic methods for ring-opening copolymerization of cyclic anhydrides with epoxides

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Guide: Prof. Debashis Chakraborty

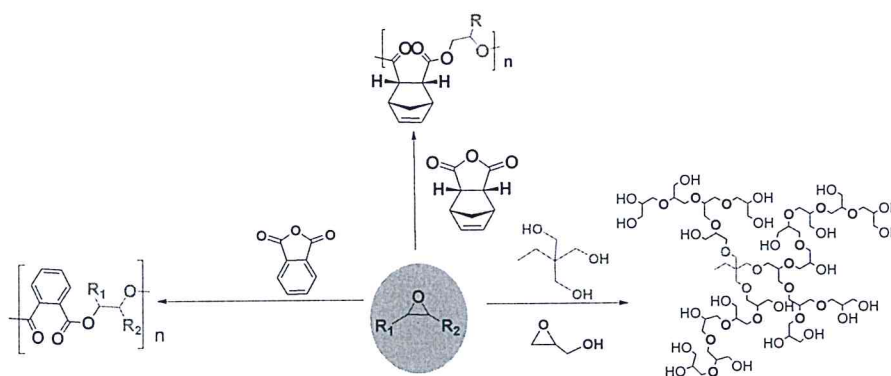
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Date: 05.09.2019

Venue: CB 310

Time: 3:00 pm

Biodegradable polymers degrade naturally in the environment under ambient conditions under microbial action. The degradation products include oxygen, nitrogen, carbon dioxide, water, biomass, and inorganic salts<sup>1</sup>. The synthesis, characterization and commodity usage of such polymers constitute an important branch in polymer sciences and engineering. Polyesters have played a prominent part in upgrading the production of biodegradable polymers<sup>1</sup>. These polymers are widely used in drug delivery systems, artificial tissues, and commodity materials especially for packaging.<sup>1-2</sup> The common route to polyester synthesis is the step-growth polymerization of diacids or diesters with diols.<sup>2</sup> However, this method has disadvantages like the removal of a small molecule side product such as water or alcohol. The reaction produces low molecular weight polymers, with broad polydispersity index (PDI).<sup>2</sup> To overcome these problems, research is directed towards catalytic ring-opening copolymerization (ROCOP) of epoxides and anhydrides as a feasible alternative. By using this technique, we get various functionalised polyesters.<sup>3-4</sup> We explored ROCOP, using various Lewis acids namely  $B(C_2H_5)_3$ ,  $Al(CH_3)_3$ ,  $Et_2Zn$  and  $nBu_2Mg$  in combination with various Lewis bases such as  $PPN^+Cl^-$ , DMAP, DBU and TBD respectively.<sup>3</sup> Similarly, iodine, alkali metal alkoxides or acetates, and transition metal acetates were used for a similar purpose. In addition, various functionalised polyesters and polyglycerols with controlled PDI and high molecular weights were synthesized. The details of these research developments will be discussed in the seminar.



[1] Longo, J. M.; Sanford, M. J.; Coates, G. W. *Chem. Rev.* **2016**, *116*, 15167-15197.

[2] Hong, M.; Chen, J.; Chen, E. Y. X. *Chem. Rev.* **2018**, *118*, 10551-10616.

[3] Kummari, A.; Pappuru, S.; Chakraborty, D. *Polym. Chem.* **2018**, *9*, 4052-4062.

[4] Paul, S.; Zhu, Y.; Romain, C.; Brooks, R.; Saini, P. K.; Williams, C. K. *Chem Commun.* **2015**, *51*, 6459-6479.

Guide

27/8/19

Seminar Coordinator

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