AMELIA BERGESON ('18)

CHEMICAL ENGINEERING

Project

Synthesis and Thin Film Morphology of Linear and Cyclic Poly(ε-Caprolactone)

Faculty Mentor

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Linear poly(ε-caprolactone) (PCL) is a biodegradable polymer. This polymer as well as its degradation products are biocompatible within the human body and because of this property the FDA has approved its use in drug delivery devices. However only limited research has investigated the properties of cyclic PCL, which is expected to have unique and complementary properties relative to the well-studied linear PCL. This lack of research is due to the fact that cyclic PCL has been previously difficult to synthesize. The initial portion of the research was to create linear and cyclic samples of PCL at various molecular weights.

The synthesis was completed over the summer of 2016 in the Grayson lab, as the Grayson lab has developed an efficient process to synthesis cyclic PCL across a wide range of molecular weights. The second portion of the research project is being conducted in Dr. Albert's lab to create and study the linear and cyclic PCL samples in thin films. Before the films can be studied their film thickness must be verified by analyzing their reflectance spectra. The films are then studied using optical microscopy and atomic force microscopy to observe the morphology and architecture of the thin films. Preliminary results show differences in the crystalline domain size and shape between linear and cyclic samples of the same molecular weight. Current research is looking at differences between low molecular weight PCL and high molecular weight PCL linear and cyclic pairs. The overarching goal of the project is to synthesize with high yields cyclic PCL and to examine its properties.

Amelia worked in conjunction with Fariah M. Haque, Giovanni Kelly, and Julie N.L. Albert.