

Chemical Engineering Thesis Defense

Aminolysis of PET Polymer using Ethylene Glycol catalyst
and Long Chain Alkyl-Amines

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Abstract

Various research papers and literature were reviewed and consulted for the depolymerization of Polyethylene terephthalate (PET) using long chain alkyl amines and Ethylene Glycol (EG) as catalyst in the aminolysis process. The main Hypothesis of this thesis is to use EG as a catalyst in the aminolysis of PET using Octylamine, Dodecylamine and Hexadecylamine. Initial reactions with the three amines were performed with and without EG to observe and compare the products obtained from the reaction to test this hypothesis. Various reaction conditions like concentration of reactants, temperature and time of reaction were later considered and employed to find the optimal conditions for the monomerization of PET After confirming the catalytic properties of EG in the aminolysis reaction. The depolymerized product was subjected to Attenuated Total Reflectance-Infrared Spectroscopy (ATR-IR Spectroscopy) to check for loss of reactants and formation of products through their Infrared peaks, Thermogravimetric Analysis (TGA) to confirm their Tg5 temperatures and Differential Scanning Calorimetry (DSC) to check for crystallinity of the obtained products. These characterization techniques were used to understand, examine, and compare the different properties of the products obtained from different reaction mixtures. The three distinct amines considered for this reaction also showed differences in the conversion rate of PET under similar reaction conditions thus signifying the importance of selecting an appropriate amine reactant for the aminolysis process. Finally, the in-situ IR probe was used to determine the reaction kinetics of the aminolysis reaction and the formation and loss of products and reactants respectively with time, proving that EG helps in the aminolysis of PET.



July 10, 2023, 9:30 AM; ECG G305;

Zoom Link: <https://asu.zoom.us/j/85086150087>