Polyester Based On Biodiesel Industry Residues

Carvalho, Ricardo F.
Civil Eng., Prof., Dr.
Univer. Federal of Bahia
Abstract

- Biodiesel production is growing exponentially offering the energy network an alternative fuel from renewable sources. However, large quantities of crude glycerol are generated as a by-product (10–30%) wt during the transesterification process of biodiesel. Although glycerol in its purified form has a number of uses, crude glycerol obtained from the biodiesel industry contains many impurities and requires expensive purification processes resulting in vast amounts of glycerol without adequate destination which are causing rise to many environmental concerns. Large scale applications of glycerol are necessary to accompany its production. Polyesters obtained via the polycondensation of glycerol with aromatic acids were prepared in different ratios. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) were used to investigate thermal stability. The composite structure was characterized by Fourier Transform Infrared (FTIR) spectroscopy and X-ray diffraction (DRX). These aromatic polyesters could offer a low cost environmentally compatible material for the production of components such as tiles, boards, sanitary vases and sinks for the construction industry.

- doi:http://dx.doi.org/10.1063/1.3663089
Transesterification process

Vegetable oil

Methanol/Ethanol

Reaction

Biodiesel

10Kg

Glycerol

1Kg

Catalyst
Nowadays application

- COSMETICS - 40%
  (creams, lotions, deodorants, lipsticks, toothpaste, makeup, etc.).

- FOOD USE - 24%
  (Keep food and beverages like soda candies, cakes, meat pastes, sauces, coverage candy, pet food m, etc.).

- TO SINTESE OF RESINS – 18%

- PHARMACEUTICAL APPLICATIONS – 7%
  (capsules, suppositories, anesthetics, syrups, ointments, antiseptics, etc.).

- INDUTRY USES – 11%
  (lubricant, manufacture of paints, etc.).
Synthesis of polyesters

- Stoichiometric ratio of glycerol with acids (1:1:5)
- Phthalic acid (PGF)
- Terephthalic acid (PGT)

Phthalic acid are low reactivity than terephthalic Acid
Synthesis of polyesters

- Introduce into a beaker and heated to 70°C under stirring constantly.
- The acids were added, the mixture and heated to 120°C.
- Were added of catalyst and temperature was raised to the 200°C.
Structural Characterization IFTR

- O-C=O
  1708-1739 cm\(^{-1}\), C=O
- 1118 – 1250 cm\(^{-1}\), C-O-C
- 1064 -1080 cm\(^{-1}\), C-O
Structural Characterization DRx / SEM

Unreacted terephthalic acid, MEV with 7KV, WD17mm, SE detector, amplified x1000
Structural Characterization DRx

Peaks from terephthalic acid
Thermal Characterization TGA

- Stable Up 200 °C
  - Process conditions
- Ahs from terephthalic acid
Conclusion

- New material environmentally compatible and low-cost material for the construction industry
  Variations of thermal stability
Conclusion

- Translucent, semi-crystalline material
Invitation and Acknowledgments

Salvador, Brasil.
13°S and 38° 31' 12"W
Acknowledgments

İlginiz için teşekkürler
Thank for your attention

Carvalho, Ricardo F.
Civil Eng., Prof., Dr.
Univer. Federal of Bahia