Reaction Time and Temperature Optimization of PET Glycolysis Catalyzed by Cobalt Oxide on Silica Support

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This work presents a PET (poly(ethylene terephthalate)) chemical recycling method that delivers higher monomer yield compared to previous studies by employing high-surface area nanocatalysts. Glycolysis of PET was carried out in the presence of cobalt oxide dispersed on 60-nm silica support, which was synthesized via water-in-oil microemulsion method. The catalyst was characterized by TEM, BET surface area, EDX, XRD and XPS. The characterization results showed a uniformly deposited layer of Co3O4 on the amorphous silica nanoparticle support. This even deposition of cobalt oxide was attained through ultra-sound assisted precipitation. The catalytic activity of the nanocomposite was evaluated and optimum reaction conditions were determined by performing glycolysis reactions at different times and temperatures. For different reaction temperatures, equilibrium was reached at different reaction times, with the highest yield exceeding 90%. For the glycolysis reactions 0.300 g of PET was used, with EG/PET molar ratio of 11:1 and catalyst/PET weight ratio of 0.01.