Process optimization of poly(ethylene terephthalate) glycolysis

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In the glycolytic depolymerization of poly(ethylene terephthalate) (PET) to recover its monomer, the transport properties of the solvolysis agent, ethylene glycol (EG), is considered to be the rate-limiting parameter. At a fixed temperature and EG/PET ratio, the loading amount of EG in the reactor determines the phases present and independently alters the reaction kinetics and equilibrium. The starting amounts of reactants were varied to adjust the EG filling ratio in the reactor and the state at which EG exists. At high temperatures where EG exists completely in the vapor or even supercritical phase, the yield is dependent on pressure and thus a higher filling ratio is better. At temperatures below 350oC, EG exists as a saturated vapor-liquid mixture and the reaction kinetics was found to change depending on the liquid/vapor composition. Thus, optimization can be done along the saturated vapor-liquid curve to adjust the reactor fill ratio and obtain an optimum production capacity.