RECYCLING OF WASTE FLEXIBLE POLYURETHANE FOAM

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ABSTRACT

THE TREATMENT OF WASTE POLYURETHANES (PU) IS MORE AND MORE IMPORTANT, AS THE APPLICATION OF PU IS STEADILY ON THE INCREASE. THE MAJOR METHODS FOR TREATING WASTE PU INCLUDE LANDFILL, ENERGY RECOVERY, MATERIAL RECYCLING, AND CHEMICALS RECYCLING ETC. THE CHEMICALS RECYCLING IS THE CHEMICAL CONVERSION OF WASTE PU INTO THE RAW MATERIALS OF PU OR PRIMARY PETROCHEMICALS BY THE ADEQUATE CHOICE OF REAGENTS AND CATALYSTS IN THE CHEMICAL GLYCOLYSIS CONDITIONS. GLYCOLYSIS IS ONE OF THE PRINCIPAL METHODS IN CHEMICALS RECYCLING. THE FACTORS THAT AFFECT THE GLYCOLYSIS OF PU INCLUDE THE TYPES OF SOLVENT AND CATALYST, THE CONCENTRATIONS OF SOLVENT AND CATALYST AND THE REACTION TIME. IN THIS STUDY, THE GLYCOLYSIS OF PU IS INVESTIGATED TO PROVIDE THE USEFUL DATA FOR THE DESIGN OF A PILOT SCALE PLANT. THE STUDY FOR THE GLYCOLYSIS OF FLEXIBLE PU FOAM ARE CARRIED OUT AT VARIOUS FORMULAS CONSISTED OF REAGENT AND CATALYST. THE EXPERIMENTS ARE PERFORMED UNDER THE ATMOSPHERIC PRESSURE AND ISOTHERMAL CONDITION (220℃). DIETHYLENE GLYCOL (DEG), POTASSIUM ACETATE (CH3COOK) ARE USED AS THE SOLVENT AND CATALYST, RESPECTIVELY. THE PROPERTIES OF GLYCOLYSIS PRODUCTS SUCH AS HYDROXYL VALUE, MASS MEAN MOLECULAR WEIGHT, VISCOSITY AND THE CONVERSION OF THE -NCOO- FUNCTIONAL GROUP IN PU ARE ANALYZED WITH DIFFERENT EXPERIMENTAL CONDITIONS. THE RESULTS INDICATE THAT THE CONCENTRATIONS WITH DEG/PU = 150%, KAC/PU = 1%, AND THE REACTION TIME = 90 MIN ARE THE BEST RATIO OF SOLVENT AND POLYURETHANE, THE CONCENTRATION OF CATALYST, AND THE REACTION TIME, RESPECTIVELY. THE AMOUNTS OF THE DISTILLATE IN THE SECOND STAGE DISTILLATION (GAS-PHASE TEMPERATURE 245 ~ 260 ℃) ARE ABOUT 13.4 ~ 43.78% UNDER THE EXPERIMENTAL CONDITIONS. SINCE THE HYDROXYL VALUE OF THE DISTILLATE OBTAINED FROM THE SECOND STAGE DISTILLATION IS CLOSED TO THAT OF THE DEG. THE RECYCLING OF PU BY THE GLYCOLYSIS WILL BE ATTRACTIVE. THE CONVERSION OF -NCOO- FUNCTIONAL GROUP IN PU AT THE OPTIMUM FORMULA (DEG/PU = 150% AND KAC/PU = 1%) CAN BE EXPRESSED BY THE TOTAL RATE EQUATION, DX/DT = 0.014 × (1-X) 3.71 × (KAC) 0.6×(DEG) 1.12. THE PROPOSED KINETIC MODEL CAN BE ACCEPTED WITH THE COEFFICIENTS OF DETERMINATION 0.8202.

Keywords : POLYURETHANE（PU）、GLYCOLYSIS、PRODUCTS ANALYSIS、KINETIC、 PURIFYING

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