Chainurak Pum-in 2006: Kinetic Rate of Polypropylene Catalytic Cracking. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Terdthai Vatanatham, Ph.D. 133 pages.
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A kinetic study on the catalytic cracking of polypropylene over cracking catalyst under atmospheric pressure was studied. Thermal gravimetric analysis (TGA) technique was used to establish the polypropylene cracking temperature used in this work. The result shows that rapid polypropylene cracking occurs at 400°C. In the experiment, cracking process was carried out in two stages. The first stage was thermal cracking in a semi-batch reactor of 1.0 dm^3 volume at atmospheric pressure with continuously flow of N_2 and a temperature range of 400-450°C. Polypropylene pellets were put inside the reactor. The second stage was a catalytic cracking done in a mixed flow reactor of the same size under N_2 at atmospheric pressure in the same temperature range. The catalyst was in 4 baskets rotating inside the mixed flow reactor. The catalyst used was an equilibrium fluid catalytic cracking catalyst (FCC E-cat). It is a common catalyst for cracking heavy vacuum gas oil to gasoline in refineries. Vapor from the first reactor was fed into this catalytic mixed flow reactor. Thermal cracking of polypropylene from the first reactor yields approximately 81-85 wt% of liquid products, while catalytic cracking produces approximately 54-66 wt% of liquid products. Catalytic cracking yields more of gaseous products and less of the liquid products compared to thermal cracking. However, catalytic cracking gives approximately 29-33 wt% of gasoline while thermal cracking produces approximately 15-20 wt%. Two lumped kinetic models were proposed including both thermal and catalytic cracking of polypropylene. They contain four and five kinetic constants respectively. Kinetic parameters were determined from the experimental data. Both lumped models show good agreement with the experimental results.

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