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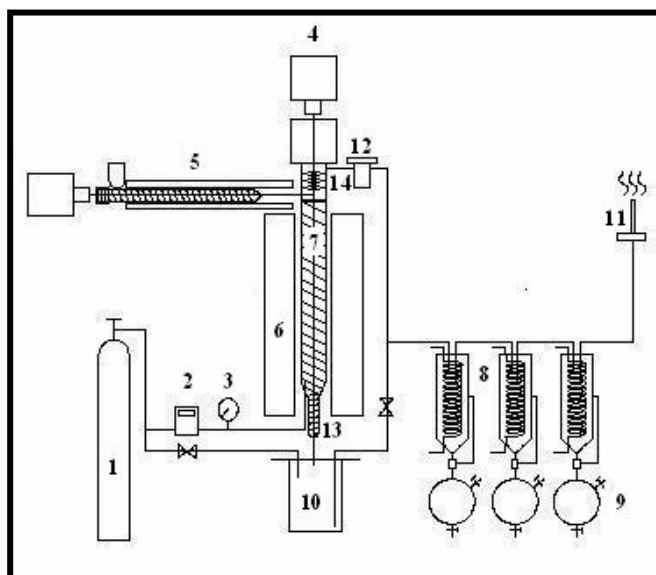
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Synthetic fuels from cracking reaction of polyethylene using zeolite beta catalyst in continuous process

At present, large amounts of plastic wastes which are difficult to degrade biologically are generated every year due to an increase in various uses of plastics [1]. Cracking of polyethylene to valuable hydrocarbons (LPG, gasoline, diesel) is one of the promising alternatives to recycle plastic wastes. Besides hydrocarbons from cracking of plastic waste can be energy resources.

In this thesis, zeolite beta will be as catalyst in cracking reaction of polyethylene with various viscosity in continuous process. The schematic diagram and reactor is shown in Figure 2.9. The polyethylene samples is loaded into the extruder. The barrel temperature is controlled by a two-zone horizontal heater at 120 and 130 °C. The polyethylene samples is molten and continuously fed into the top of the reactor at 430 °C. The reactor is equipped with a single screw designed for carrying feed and catalyst down through the bottom of the reactor and allow cracked gases to exist from the top of the reactor. Stirring of the polyethylene samples inside the reactor is achieved by means of an electric motor and the rotating single screw. Nitrogen is used as a carrier gas with a flow rate of 50 ml/min. The vaporized wax can be trapped in wax trap unit and the liquid products are collected at approximately 40 °C in the first cooling condenser and at -5 °C in the second and third condensers. Gaseous and liquid products is analyzed using Gas chromatographer (GC), Automatic distillation analyzer, IROX 2000, and Nuclear magnetic resonance spectrometer (NMR). Catalyst content of residue is determined using Thermogravimetric analyzer (TGA)



Schematic representation of continuous process : 1. Gas N₂ ; 2. Flow meter; 3. Pressure gauge; 4. Motor; 5. Extruder; 6. Furnace; 7. Reactor chamber; 8. Liquid trap condenser; 9. Product collector; 10. Residue chamber; 11. Flair; 12. Wax trap; 13. Reactor screw; 14. Stainless discs

