STUDY OF CARBON BLACK PYROLYSIS FROM WASTE TIRES

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ABSTRACT

The build up of tires waste lately was a considerable environmental problem in the world, including in Indonesia. Tires takes a long time to naturally degraded because it are made of rubber material in form CxHy that having carbon content and high volatile matter. Various studies have been carried out to overcome these problems, one of which is a pyrolysis. This research was focused on the production of carbon black from pyrolysis of tires.

The research studies of tires pyrolysis to produce carbon black have aims to study the effect of heating rate, particle size, pyrolysis time and pyrolysis temperature on the magnitude of the fixed carbon contain and the characteristics of carbon black. The pyrolysis process was done using a semi-batch unstirred stainless steel reactor with a capacity of 1150 cm³, operating at 1 atm. The research was done in three stages. The first stage of this research is to reduce the size of the tires to be a tire scrap. The next stage was 30 grams scrap tires of various of sizes (-10/+16 mesh, -16/+20 mesh and -20/+30 mesh), was feed into the reactor. Nitrogen flowed into the reactor at rate of 1 liter/minute to clean the product gas (oxygen) that can disrupt the process of pyrolysis. Then the sample is heated to a temperature of 400, 500, or 600 °C and maintained at certain time of 30, 60, or 90 minutes. Heating rate is set at 10, 15, and 20 °C/min (by setting the electric current). The last step was taking the carbon black product, calculating the yield and analyze the product to determine the effect of heating rate, particle size, pyrolysis time and pyrolysis temperature on the fixed carbon contain and characteristics of the carbon black produced.

Heating rate, particle size, time, and pyrolysis temperature has a significant influence on the fixed carbon contain yield and the characteristics of the carbon black. The highest fixed carbon contain (61.8984 %) is generated at the heating rate of 20 °C/min, the particle size of -20/+30 mesh, pyrolysis time of 90 minutes, and the pyrolysis temperature of 400 °C. The best characteristics of carbon black represented by iodine number analysis (315.27 mg/g), ash content (3.0983 %), is generated at the heating rate of 10 °C/min, the particle size of -10/+16 mesh, pyrolysis time of 90 minutes, and the pyrolysis temperature of 600 °C. The best moisture content product was generated on the heating rate of 20 °C/min, the particle size of -20/+30 mesh, pyrolysis time of 90 minutes, and the pyrolysis temperature of 600 °C.

Keywords : pyrolysis, waste tires, carbon black