Study on Pyrolysis of the Waste from the Paper Industry

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ABSTRACT

The object of this study is to investigate the kinetics and products properties for the pyrolisis of wastes from the paper industry in nitrogen environment. The pyrolysis experiments of wastes (plastic, paper, and cloth) from the paper industry were performed in nitrogen environment, and at the heating rates of 2, 5, and 10 K/min, respectively, aims to establish the model of pyrolysis reaction. The pyrolysis products at the temperatures the maximum instantaneous rate (plastic), the ends of the first and second stage reactions (paper and cloth) were collected and analyzed to investigate the pyrolysis mechanism. The results indicated that the pyrolysis be haviors of plastic and paper/cloth can be observed as one- and two-stage mass change reactions, respectively. The total reaction rates can be expressed as follows. Waste plastic dX/dt＝4.8×1012exp(-44.85/(RT))(1-X)1.6 Waste paper dX/dt＝0.78dX1/dt ＋0.22dX2/dt dX1/dt＝9.61×1010exp(-33.43/(RT))(1-X)1.63 dX2/dt＝32.79 exp(-9.47/(RT))(1-X)0.91 Waste cloth dX/dt ＝0.8dX1/dt＋0.2dX2/dt dX1/dt＝3.24×109exp(-29.23/(RT))(1-X)1.41 dX2/dt＝26.58 exp(-10.34/(RT))(1-X)0.37 For the analyses of pyrolysis products, the solid residues have the highest calorific value of 7033 kcal/kg when the cloth pyrolysed to 370 ℃. The main gaseous products were H2, CO, CO2, H2O, and hydrocarbons (HCS). The HCS consisted of low molecular mass paraffin and olefin. All kinds sample, the gaseous product had the highest calorific value of 5152.71 kcal/m3 when the plastic pyrolysed to 620 ℃ in nitrogen enrironment. The liquid products of the plastic were muiuly H2O, hydrochloric acid, acetic acid and 1-butanol. The liquid main products of the paper/cloth were H2O and acetic acid.

Keywords : pyrolysis ; paper industry ; plastic ; paper ; cloth

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