Study on Pyrolysis of Sludge and Waste Mixtures from the Paper Industry

陳建全、吳照雄

E-mail: 9608203@mail.dyu.edu.tw

ABSTRACT

The pyrolysis of the sludge and waste from the paper industry was investigate in this study. The pyrolysis products were analyzed to evaluate the probability for resources recycling as a chemical and gas-liquid fuels. The conents in this study include establish of the pyrolysis model as well as analyzing the pyrolysis products and the distributions of the product concentration. For the kinetic analyzes, the thermogravimetic analysis experiments were performed at the heating rates of 2, 5 and 10 K/min. The results indicated that the pyrolysis of sludge in nitrogen environment is a three-stage reaction, which can be expressed as followings. dX=0.42dX1/dt+0.38dX2/dt+0.2dX3/dt dX1/dt=9.17×1013exp(-40.33/(RT))(1-X1)7.04 dX2/dt=1.86 ×1011exp(-36.47/(RT))(1-X2)6.76 dX3/dt=3.33×1010exp(-52.57/(RT))(1-X3)0.48 Under the heating rates of 2, 5 and 10 K/min, the total rate equations of waste mixs pyrolysis (including sludge and not including sludge) in N2 environment can be expressed the sum of the individual rate equations according to the mass percentages if its. The coefficients of determination were 0.997, 0.997 and 0.994 for pyrolysis of waste mixs(including sludge), and 0.996, 0.997, and 0.996 for for pyrolysis of waste mixs(not including sludge), respectively. For the products analysis, the percentages of solid, liquid, and gases products were obtained for sludge and waste mixyures(including sludge and not including sludge) pyrolysis at constant temperature. The results also indicated that the soild residues reduced as the pyrolysis temperature increased. The total amount of liquid products increased as the pyrolysis temperature increased. But its add met obvious. The total amount of gases products increased significantly with the pyrolysis temperature increased. H2,CO,CO2,CH4,C2H4 were main specites is the gases products. The maximum concentration of hydrocarbons 2959 ppm for waste mixture (not including sludge) pyrolysis reaction. The calorific values of solid residues were to present a positive rulable ship to the content of fixed carbon. The percent recoverys were above 85% for pyrolysis of the sludge and waste from the paper industry.

Keywords : paper industry ; mix waste ; pyrolysis ; sludge

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