

An experimental study on production of carbon black using organic solvents with manufactured char of scrap automotive waste tire

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Each year, occurrence of waste tire has been increased with industry development. Recently, several experts have been recommended to pyrolysis and treatment by organic solvent of waste tires for recycling resources and restraint of environmental pollution. In this study, product yields (liquid, solid and gas) were obtained from pyrolysis experiments of scrap waste tire using a tube furnace in nitrogen atmosphere under four residence time (5, 10, 20 and 30min) and three isothermal conditions (500°C). Using a scanning electron microscope (SEM), transmission electron microscopes (TEM), proximate or/and ultimate analysis, characteristics of produced carbon black (CB) during pyrolysis at 500°C and commercial CB (N660 and ISAF) were analyzed. Using the chemical equilibrium model, according to temperature change from 25°C to 150°C, the yields of products of $C(s) + 3ZnO(s) + S(s) \rightarrow CO + SO_2 + Zn(s)$ (subscripts (s) refer to solid phase) were predicted as CO (1.7E-09 ~ 2.0E-01 kmol), SO₂ (1.3E-26 ~ 2.0E-02 kmol) and Zn (6.1E-17 ~ 1.0E-01 kmol), respectively, while the remainders were predicted as C(s) (9.5E-01 ~ 8.0E-01 kmol), ZnO(s) (1.0E-01 ~ 1.0E-36 kmol) and S(s) (2.0E-02 ~ 5.9E-04 kmol), respectively.