

APPLICATION OF PURIFIED AND MODIFIED - PYROLYTIC CARBON CHAR IN RUBBER COMPOUNDING

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The waste tire pyrolysis process has attracted considerable interest as a sustainable solution to manage the accumulation of waste tires worldwide. The process produces three main fractions: gas, liquid and solid. The gaseous and liquid fractions are useful in industry as fuels; however, the solid fraction rich in carbon black has no use in Sri Lanka due to the presence of many impurities. The present study describes an efficient and economical route to purify contaminated pyrolytic char to manufacture value-added products. The pyrolytic carbon char was first passed through a 200 µm mesh to separate small particles, followed by size reduction by ball milling. These particles were demineralized stepwise using dilute HCl acid and NaOH at 60 °C for 1.0 h. Treated and untreated samples were characterized by carbon, hydrogen and nitrogen analysis, X-Ray Diffraction analysis and iodine adsorption experiments. The purified carbon black samples were used as reinforcing fillers for preparing rubber compounds according to the American Chemical Society 1 (ACS 1) formula. The physicomechanical properties of rubber compounds of purified carbon black prepared were consistent with compounds prepared with commercial carbon black, N660 and N330. CHN analysis shows that crude pyrolytic char (C-PT) contains 69% carbon, which can be improved up to 90% after washing with 2 M HCl twice and 2 M NaOH once. The iodine number of the sample was improved after demineralization (C-PT 180 mg/g and demineralized sample have 215 mg/g and 188 mg/g, 240 mg/g N660 and N330). There is no significant difference between the abrasion, tensile, tear, and compression properties of controls and ball-milled-treated samples. The average of all compound hardness is similar to the controls. The efficiency and value of the purification protocol in the current study were confirmed by test results and showed high potential application in the industry.

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