

Effects of acid treatments on the properties of pyrolytic carbon char in rubber carpet formulations

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Pyrolysis is important not only for recycling waste tyres but also for recovering valuable economically important materials such as pyrolytic oil. The generation of pyrolytic char (PT-char) as a byproduct is problematic as it has a minimum market value due to the presence of many impurities. The current study focuses on employing different acid treatments to upgrade the properties of pyrolytic char in to commercial grade carbon black. The PT-char samples were passed through a 200 micron sieve prior to acid treatments. Acid treatments were conducted in three categories mild, medium and high concentrations. The purified samples were evaluated through X-ray Diffraction (XRD), Elemental analysis, Scanning Electron Microscope (SEM), and Thermal Gravimetric Analysis (TGA) and compared with commercially available carbon black: N330. All of these samples were then used as filler in rubber carpet formulations to investigate the feasibility of refined PT-Char to be used in rubber industry. Test rheological (minimum and maximum torque, scorch time, cure rate index) and mechanical properties such as tensile strength, hardness, tear strength, compression and abrasion volume loss for the prepared rubber compounding. According to the analyses, the acid treatment improved the carbon percentage of the PT-char while improving the physic-mechanical properties of rubber compounding as well over crude PT-char. Although acid treatments reduce impurities, the ash content reduce around 12% percent to 2% - 3% percent in PT-char samples and high concentrations of acids were unaffected by the physico-mechanical properties of the rubber compounding. The mild concentration outperforms the high concentrations in terms of rubber compounding. As a result, value addition for PT- char waste can be accomplished in a cost-effective manner.

Key Words: acids, pyrolysis, pyrolytic char, purification, waste tyre

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