Sintesis Nano-Biochar dari Lignin Tandan Kosong Kelapa Sawit (TKKS) sebagai Komplemen Karbon Pada Vulkanisasi Styrene Butadiene Rubber (SBR) dengan Carbon Black N330 = Synthesis of Nano-Biochar from Oil Palm Empty Fruit Bunch (OPEFB) Lignin as Carbon Complement in Vulcanization of Styrene Butadiene Rubber (SBR) with Carbon Black N330

Rifka Charmelita, author

Abstrak

Industri ban menyerap sekitar 80% produksi karet dunia dengan kebutuhan carbon black sebanyak 240.000 ton per tahun. Carbon black (CB) umumnya digunakan sebagai filler karet ban untuk meningkatkan sifat mekanis dan memberikan pigmen warna hitam. Sampai saat ini,70% kebutuhan CB masih diimpor dari China dan India. Lignin TKKS merupakan senyawa aromatik dengan kandungan karbon sebesar 60% yang berpotensi sebagai reinforcing filler karet ban setelah terdekomposisi menjadi biochar. Penelitian ini bertujuan untuk memperoleh karakteristik unsur dan morfologi nano-biochar pada suhu 400, 500, dan 600oC serta memperoleh pengaruh rasio nano-biochar terhadap CB N330 pada sifat mekanis karet ban. Nano-biochar pada setiap suhu dianalisis karakteristik fisika-kimianya. Hasil penelitian menunjukkan yield biochar berkurang seiring dengan meningkatnya suhu pirolisis. Jumlah fixed carbon dan kandungan karbon tertinggi diperoleh pada suhu pirolisis 600oC. Sementara itu, luas permukaan biochar tertinggi diperoleh pada suhu pirolisis 500oC sebesar 86,79 m2/g. Struktur biochar yang lebih berpori diperoleh pada suhu 600oC. Sifat mekanis karet ban lebih tinggi pada tensile strength, elongation at break, modulus 100%, tear strength, dan hardness diperoleh ketika SBR dicampur dengan filler 25% nano-biochar. Hal ini membuktikan potensi biochar sebagai komplemen karbon CB N330 dalam meningkatkan sifat mekanis karet ban.

.....The tire industry absorbs about 80% of the world's rubber production with a carbon black requirement of 240,000 tons per year. Carbon black (CB) is commonly used as a tire rubber filler to improve mechanical properties and provide black pigment. Until now, 70% of CB needs are still imported from China and India. Lignin of TKKS is an aromatic compound with a carbon content of 60% which has the potential as a reinforcing filler for tire rubber after being decomposed into biochar. This study aims to obtain the elemental and morphological characteristics of nano-biochar at temperatures of 400, 500, and 600oC and to obtain the effect of the ratio of nano-biochar to CB N330 on the mechanical properties of tire rubber. Nano-biochar at each temperature was analyzed for its physico-chemical characteristics. The results showed that the biochar yield decreased as the pyrolysis temperature increased. The highest amount of fixed carbon and carbon content was obtained at 600oC pyrolysis temperature. Meanwhile, the highest biochar surface area was obtained at 500oC pyrolysis temperature of 86.79 m2/g. A more porous biochar structure was obtained at 600°C. Higher mechanical properties of tire rubber in tensile strength, elongation at break, 100% modulus, tear strength, and hardness were obtained when SBR was mixed with 25% nano-biochar filler. This proves the potential of biochar as a complement to CB N330 carbon in improving the mechanical properties of tire rubber.