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PREPARATION AND CHARACTERIZATION OF COCONUT SHELL ACTIVATED CARBON BLACK FOR ELECTROPHOTOGRAPHY TONER APPLICATION

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Coconut shells (CS) are one of the main domestic wastes that are abundantly used as a precursor to producing activated carbon black (ACB) for various purposes. This study investigated a low-temperature chemical activation method (LTCA) using NaOH to prepare ACB from CS to apply as the black colourant in toner production. Initially, the cleaned CSs were subjected to a pyrolysis process at 550 °C for 4 hrs, and the resulting coconut charcoal was activated using NaOH at 120 °C. The porosity of the resulting ACB was investigated at different charcoal and NaOH solution volume ratios. The chemical characteristics, surface morphology, surface area and crystallinity of the ACB, and mineralogy of initial coconut ash were examined using Fourier-transform infrared (FT-IR) spectroscope and scanning electron microscopy (SEM) and powder X-ray diffraction (PXRD) analyses. The current study found that the weight percentage of ash in a CS is 0.6% and consists of SiO_2, MgO, $CaCO_3$, MnO, TiO_2, CaO, Al_2O_3, Fe_2O_3, P_2O_5, and fixed carbon. The PXRD shows the increase of graphitic nature with increasing NaOH volume. The FT-IR proves that ACB consists of carbonyl groups, carboxylic groups, aromatic C=C bonds and aromatic C-H out-of-plane deform bonds as the main functional groups, indicating the formation of aromatic compounds. The SEM images indicate that increasing NaOH volume causes irregular-shaped micropores with large diameters compared to the low NaOH volume exhibiting spherical micropores. Therefore, it concludes that LTCA with less NaOH volume causes the slow removal of C as CO_3^{2-} from the ACB and increases the surface area. In the future, these ACBs will be used to produce toners to identify the eligibility as the colourant for electrophotography toners.

Keywords: Activated carbon black, Chemical activation, Coconut shells, NaOH