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Innovation Potential of Palm Kernel Shells from the Littoral Region in Cameroon

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Abstract : This work investigates the ultrastructure, physicochemical and thermal properties evaluation of Palm Kernel Shells (PKS). PKS Tenera waste samples were obtained from a palm oil mill in Dizangué Sub-Division, Littoral region of Cameroon, while PKS Dura waste samples were collected from the Institute of Agricultural Research for Development (IRAD) of Mbongo. A sodium hydroxide solution was used to wash the shells. They were then rinsed by demineralised water and dried in an oven at 70 °C during 72 hours. They were then grounded and sieved to obtained powders from 0.04 mm to 0.45 mm in size. Transmission Electron Microscopy (TEM) and Surface Electron Microscopy (SEM) were used to characterized powder samples. Chemical compounds and elemental constituents, as well as thermal performance were evaluated by Van Soest Method, TEM/EDXA and SEM/EDS techniques. Thermal characterization was also performed using Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA). Our results from microstructural analysis revealed that most of the PKS material is made of particles with irregular morphology, mainly amorphous phases of carbon/oxygen with small amounts of Ca, K, and Mg. The DSC data enabled the derivation of the materials' thermal transition phases and the relevant characteristic temperatures and physical properties. Overall, our data show that PKS have nanopores and show potential in 3D printing and membrane filtration applications.

Keywords : DSC, EDXA, palm kernel shells, SEM, TEM
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