

Characterization and Nanostructure Formation of Banana Peels Nanosorbent with Its Application

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Abstract : Characterization and nanostructure formation of banana peels as sorbent material are described in this paper. The transformation of this agricultural waste via mechanical milling to enhance its properties such as changed in microstructure and surface area for water pollution control and other applications were studied. Mechanical milling was employed using planetary continuous milling machine with ethanol as a milling solvent and the samples were taken at time intervals between 10 h to 30 h to examine the structural changes. The samples were characterised by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infra-red (FTIR), Transmission electron microscopy (TEM) and Brunauer Emmett and teller (BET). Results revealed three typical structures with different deformation mechanisms and the grain-sizes within the range of (71-12 nm), nanostructure of the particles and fibres. The particle size decreased from 65 μ m to 15 nm as the milling progressed for a period of 30 h. The morphological properties of the materials indicated that the particle shapes becomes regular and uniform as the milling progresses. Furthermore, particles fracturing resulted in surface area increment from 1.0694-4.5547 m²/g. The functional groups responsible for the banana peels capacity to coordinate and remove metal ions, such as the carboxylic and amine groups were identified at absorption bands of 1730 and 889 cm⁻¹, respectively. However, the choice of this sorbent material for the sorption or any application will depend on the composition of the pollutant to be eradicated.

Keywords : characterization, nanostructure, nanosorbent, eco-friendly, banana peels, mechanical milling, water quality

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