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Removal of Heavy Metal, Dye and Salinity from Industrial Wastewaters by Banana Rachis Cellulose Micro Crystal-Clay Composite

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Abstract : The consumption of water by various industries is increasing day by day, and the wastewaters from them are increasing as well. These wastewaters consist of various kinds of color, dissolved solids, toxic heavy metals, residual chlorine, and other non-degradable organic materials. If these wastewaters are exposed directly to the environment, it will be hazardous for the environment and personal health. So, it is very necessary to treat these wastewaters before exposing into the environment. In this research, we have demonstrated the successful processing and utilization of fully bio-based cellulose micro crystal (CMC) composite for the removal of heavy metals, dyes, and salinity from industrial wastewaters. Banana rachis micro-cellulose were prepared by acid hydrolysis (H_2SO_4) of banana (Musa acuminata L.) rachis fiber, and Bijoypur raw clay were treated by organic solvent tri-ethyl amine. Composites were prepared with varying different composition of banana rachis nano-cellulose and modified Bijoypur (north-east part in Bangladesh) clay. After the successful characterization of cellulose micro crystal (CMC) and modified clay, our targeted filter was fabricated with different composition of cellulose micro crystal and clay in the locally fabricated packing column with 7.5 cm as thickness of composites fraction. Waste-water was collected from local small textile industries containing basic yellow 2 as dye, lead (II) nitrate [$Pb(NO_3)_2$] and chromium (III) nitrate [$Cr(NO_3)_3$] as heavy metals and saline water was collected from Khulna to test the efficiency of banana rachis cellulose micro crystal-clay composite for removing the above impurities. The filtering efficiency of wastewater purification was characterized by Fourier transforms infrared spectroscopy (FTIR), X-ray diffraction (X-RD), thermo gravimetric analysis (TGA), atomic absorption spectrometry (AAS), scanning electron microscopy (SEM) analyses. Finally, our all characterizations data are shown with very high expected results for in industrial application of our fabricated filter.

Keywords : banana rachis, bio-based filter, cellulose micro crystal-clay composite, wastewaters, synthetic dyes, heavy metal, water salinity
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