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Synthesis and characterization of SnO_2 nanofiller from recycled expanded polystyrene

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An efficient way to derive values from waste polymers is through the development of blends and nanocomposites from the wastes. This will help to enhance the mechanical properties of the recycled polymers that are often lost when other methods of recycling are employed. The aim of this study is to prepare and characterize SnO_2 nanofiller from recycled expanded polystyrene wastes (rEPS). The rEPS was obtained from the University of Johannesburg recycling facility. The rEPS was dispersed in benzene and was sonicated for about 20 minutes. Afterwards, $SnCl_4.2H_2O$ was added to the mixture and sonicated for another 20 minutes. It was then subjected to heat at a temperature of 250 °C for 3 hours. The resulting product was characterized using SEM, EDX, FTIR, TEM, XRD and BET. Based on the results obtained, spherical-shaped particles between 5 µm and 50 µm were obtained from the SEM analysis, the EDX showed that tin, chlorine and oxygen were all present in the synthesised nanofiller while only carbon and oxygen were present in the control experiment. The FTIR analysis showed the wider band at around 3400 cm^{-1} and the peak at 1630 cm^{-1}. The TEM showed a particle size between 7 and 12 nm and the XRD indicated that the material is crystalline with tetragonal shape and the BET showed isotherm with a microporous adsorbent. This work demonstrated an efficient method to upcycle waste polymer in an economical way while the properties of the polymers would still be retained.

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