Deposition of nanostructures derived from electrostatically stabilised TiO2 aqueous suspension onto a biocomposite

ABSTRACT

A nanostructure derived from TiO2 particle deposition onto a biocomposite surface derived from coir dust (CD) was developed to control degradation using a spray dry technique. To stabilise and reduce the size of dispersed particles, the TiO2 powder was prepared in deionised water at pH 10 and sonicated at 20kHz and 400W. The coir dust was obtained from coconut kernel waste and underwent drying treatment before it was mixed with polypropylene (PP) as the substrate. The suspension consisted of particles with an average size and zeta value of 285nm and -19.2mV, respectively. The suspension was spray dried onto a hot-pressed substrate (biocomposite) with a surface roughness between 0.23 and 1.57μm at ambient temperature. Scanning electron microscopy image analysis and Fourier transform infrared spectroscopy analysis indicated that the TiO2 particles were successfully deposited onto the substrate, shown by the existence of a carboxylic acid group (COOH) in the CD matrix. Moreover, the weight of the deposited substrate increased exponentially with deposition time compared to pure PP substrate. However, the deposition rate of TiO2 nanoparticles was limited by the ratio of the substrate surface roughness to particle diameter, as predicted by a previous study.

Keyword: Colloid; Spray dry; Coir dust; Surface roughness; Deposition velocity