Utilization of agrowaste-derived nanoparticles as reinforcement in microfilled epoxy composites.

ABSTRACT

The substantial release of oil palm ash into ground water has been a serious concern to the environmentalist due to the enormous generation of oil palm ash waste from oil palm incineration. The effective utilization of this agrowaste is yet to be fully exploited. In this context, herein we, investigated the potential of oil palm ash nanofiller as an effective reinforcement in epoxy-based composites. Transmission electron microscopy (TEM) revealed that the prepared oil palm ash nanoparticles had circular morphology with particle size in the range of 20 to 25 nm. X-ray diffraction patterns of the prepared oil palm ash nanoparticles revealed the crystalline nature of the oil palm ash nanoparticles. Tensile strength and tensile modulus of the epoxy composites were substantially improved to 64, 67, 70, and 75 MP a and 1.01,1.05,1.16, and 1.18 MP a at oil palm ash nanofiller loading of 1%,2%,3%,and %,respectively.The impact strength of nanocomposite was enhanced from 2.7015 ± 0.13 kJ/m2to 3.98 ± 0.17kJ/m2 at 3% of oil palm ash nanofiller loading. The optimum values of mechanical properties were attained at 4% filler loading,after which further loading resulted in the decrement of mechanical properties of epoxy nanocomposite. Thermal stability of the epoxy nanocomposite was enhanced substantially to 435 °C by the incorporation of oil palm ash nanofillers. This study proved that nano-sized oil palm ash could be an efficient reinforcement in polymer composite.

Keyword : Oil palm ash; Epoxy resin; Nanocomposite; Thermal stability, Impact strength.