Synthesis and characterization of granite dust microparticles reinforced bio-benzoxazine com

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Abstract

In the current work, an effort has been made to create polymer composite materials using polybenzoxazine (PBz), which is synthesis from sustainable natural ingredients like furfurylamine (Fu), cardanol (Ca) and reinforced with granite dust made from industrial waste. Varied analytical approaches were used to examine the thermal, morphological, chemical structure, flame retardant and electrical properties of Ca-Fu-PBZ composites reinforced with granite dust at varied weight percentages (5, 10, 15 and 20 wt%). According to the weight percentage concentration of granite dust, the differential scanning calorimetry (DSC) data suggest that the value of Tg increased from 105 to 139°C. A pure Ca-Fu-PBZ benzoxazine matrix was found to have a dielectric constant of 3.97 at 1 MHz. Whereas 5, 10 and 20 wt percentages of reinforced Ca-Fu-PBZ composites with granite dust had dielectric constants of 3.54, 3.05, 2.51 and 2.02 at 1 MHz, respectively. For granite dust reinforced Ca-Fu-PBZ polybenzoxazine composites, the value of the limiting oxygen index (LOI) determined for the char yield obtained thermogravimetric analysis (TGA) shows greater values than those of the neat Ca-Fu-PBZ matrices. Using water contact angle, the hydrophobic behavior of polybenzoxazine composites reinforced with granite dust was investigated, and it was concluded that the hydrophobic behavior increased with the weight % of granite dust. Data from several investigations show that the thermally stable electrical insulation applications can employ the granite dust reinforced sustainable cardanol-furfurylamine based polybenzoxazine composites as potting compounds, sealants and composites.