Boron Doped Graphitic Carbon Nitride Reinforced Phenylenebis(Azomethine)Diphenol and Bio-Phenol Based Hybrid Polybenzoxazine Composites for High Dielectric Application

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Aims and scope

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Abstract

The phenylenebis(azomethine)diphenol was synthesized using p-hydroxybenzaldehyde and p-hydroxyacetophenone with a view to develop benzoxazines having conjugated azomethine chemical structure through Mannich reaction. The phenylenediazomethine core benzoxazine was hybridized with four different types of bio-based benzoxazines. The chemical structure of benzoxazines and hybrid polybenzoxazines were confirmed using spectral analyses. The curing behavior of benzoxazine and its blends was analyzed using differential scanning calorimetric (DSC) technique. The graphitic carbon nitride and boron doped graphitic carbon were prepared and reinforced with varying weight percentages to the polybenzoxazine matrix. The thermal stability of neat benzoxazine matrix, blends and composites were studied using TGA technique. Among the benzoxazine composites, boron doped graphitic carbon nitride filled composites possess better thermal stability than that of other composites. The maximum degradation temperature and the char yield of 15 wt% of gBCN-c reinforced polybenzoxazine composites were noticed at 469^{o}C and 49% respectively. All the composite samples possess the value of water contact angle more than 140^{o}. The value of dielectric constant (k) of 15 wt% of gCN-c and gBCN-c reinforced composites was noticed at 7.0 and 7.5 respectively. Findings from different studies suggest that hybrid polybenzoxazine composites can be used for the microelectronic utilizations under various environmental conditions.