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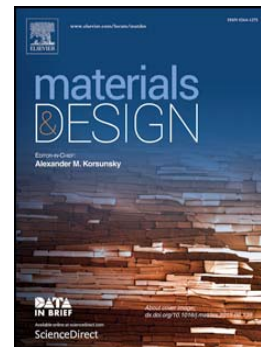
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Mechanical, thermal and dielectric properties of hybrid composites of epoxy and reduced graphene oxide/iron oxide

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ABSTRACT

A hybrid filler (RGO-Fe₂O₃) composed of inorganic nanoparticles of iron oxide (Fe₂O₃) on reduced graphene oxide nanoplatelets (RGO) was successfully synthesized using a microwave assisted chemical reaction. Incorporating RGO-Fe₂O₃ in epoxy through in situ polymerization afforded RGO-Fe₂O₃/epoxy composites. Thermogravimetric analysis demonstrated the thermal stability of RGO-Fe₂O₃/epoxy composites. Improved property profiles of RGO-Fe₂O₃/epoxy were established through electrical conductivity measurements and dielectric properties in the range 40 Hz to 30 MHz and at microwave frequencies in the S band (2-4 GHz) region. Mechanical property measurements were also performed. Dielectric constant, electrical conductivity and absorption coefficient of RGO-Fe₂O₃/epoxy composites were found to be much higher than that of the neat epoxy matrix. Addition of 0.25 phr RGO-Fe₂O₃ increased the tensile strength, flexural strength and impact strength by 56%, 81% & 112% respectively. Fracture toughness determined using single-edge notch three-point-bending specimens also showed an impressive enhancement. Microstructure studies like scanning electron microscopy and transmission electron microscopy demonstrated good interfacial adhesion, the underlying reason for overall improvement in mechanical properties.

Key words: Epoxy Resin; composites; iron oxide; reduced graphene oxide.

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