Abstract

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Synthesis, Characterization and Microwave Absorption Properties of Reduced Graphene Oxide Nanocomposites

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Abstract

The discovery of graphene and subsequent development of graphene-based nanocomposites in different matrices including that in polymer is an important addition in the area of nanoscience and technology. This work deals with the studies on the dielectric and microwave absorption properties of the nanocomposites of graphite, graphite oxide (GO) and reduced graphene oxide (RGO) in silicone rubber matrix. GO with different reaction time (24, 48 and 72 h) was successfully synthesized by a modified Hummers method. A systematic investigation for the effect of reaction time on the oxidation degree of GO was carried out. The increased interlayer spacing obtained from XRD data and decrease in C/O ratio revealed from elemental analysis of GO indicated that the more oxygen containing groups formed with more reaction time. GO on heat treatment at ~300 °C resulted into exfoliation and simultaneous reduction of grapheme oxide termed as RGO. The exfoliated RGO exhibited a few layer structure. It was confirmed that raising the temperature could promote reduction of GO under ambient atmosphere on the basis of XRD data, specific surface area data, elemental analysis and conductivity data. Silicone rubber composites of graphite, graphite oxide and reduced graphene oxide were prepared for the investigation of their effective dielectric permittivity.

This experimental project aims to offer the effect of RGO concentration on dielectric permittivity has also been studied and the study clearly show that dielectric loss tangent increases with the increase of RGO concentration. Among all composite systems, RGO nanocomposite showed most promising dielectric loss. Microwave absorption property was also measured. The microwave absorption of all RGO nanocomposite is very close to each other and nanocomposite with a very thin thickness of ~ 1.5 mm cover almost whole Ku band. Results show that RGO can be considered as an alternative of much expensive carbon nanotubes-based nanocomposites for specific microwave absorption application.

Biography

About me – I have completed my Dual Degree B.tech + M.tech Integrated course in Nanoscience and Nanotechnology from University of Rajasthan, Jaipur, India and did my project at Defence Laboratory (DRDO), Jodhpur. I have keen interest in Nano Diamond Batteries and also did research review work with a startup company which is situated in Indian Institute of Technology Guwahati on various topics like biocementation, EV batteries, etc.

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