

ABSTRACT

A study on physical property dependent EMI shielding effectiveness behaviour of some magnetic and conducting nanofillers incorporated PVDF nanocomposite system.

Tanmoy Chakraborty

Index No.: 135/22/Phys./28

Registration No.: SOPHY1113522

Abstract: In the variety of applications where waves interact with matter, it is required to enhance the ability of the materials to shield the electromagnetic interference (EMI) in terms of reflection at the surface and absorption into the bulk structure of the materials. When EM radiation is absorbed, it is transformed into heat energy and released into the atmosphere, but when it is reflected and transmitted it remains unaltered. The continuous exposure of EM radiation on living object causes many long-term health hazards such as Alzheimer's disease, infertility and AUTISM etc. The main objective of this work is to increase the absorption of EM radiation in the microwave (MW) frequency region. It is possible to enhance absorption of MW radiation in numerous ways over reflection and transmission. In this report the incorporation of magnetic fillers into the polymer system, magnetic-conducting binary nanofillers incorporated polymer system and their further modifications in form of multi-layer as well as non-conducting polymer jacket coated multi-layer polymer nanocomposite structure has been developed to enhance the absorption of MW radiation. The presence of crystallographic phase of the nanocomposite films has been confirmed using XRD analysis. The surface morphology of the nanofillers and nanocomposite films estimated using FESEM micrographs. The role of magnetic response to modulate the absorption property has been investigated using M-H loop study of the magnetic nanofillers and nanocomposite films. The EMI shielding study has been carried out and the estimations of the attenuation percentage for absorption of the MW radiation by the nanocomposite system has been done. The attenuation constant, which symbolizes the ability of integral attenuation of the incident EM wave inside the material has been calculated from the real and imaginary component of relative permeability and permittivity of the nanocomposite films in the MW frequency region. Therefore, the formation of these magnetic nanofillers incorporated and magnetic-conducting binary nanofillers incorporated nanocomposite films as well as their tailor-made multi-layer structure make them more efficient to come out as a unique concept of improving the absorption property (SE_A) and the total shielding effectiveness (SE_T) of these laminated nanocomposite films.

Tanmoy Chakraborty
09/07/2024

Soumyaditya Sutradhar
09/07/2024



Dr. Soumyaditya Sutradhar
Assistant Professor
Department of Physics
Jadavpur University
Kolkata-700032