Microwave absorption properties of electromagnetic composites filters based on reduced graphene oxide and carbonyl iron

Ana Gabrielle Impere[1,2], Adriana Medeiros Gama[2], Emerson Sarmento Gonçalves[3,2], Maurício Ribeiro Baldan[4], Adriano Luis De Paula[2], Aline Fontana Batista[2]

[1]Universidade Federal de São Paulo, [2]Instituto de Aeronáutica e Espaço, [3]Instituto Tecnológico da Aeronáutica, [4]Instituto Nacional de pesquisas espaciais

e-mail: anagabyimpere@gmail.com

Electromagnetic composites filters are based on materials with dielectric or magnetic properties to absorb high intensity of electromagnetic wave incident. This work aims a combination of characteristics of a filter producing reduced graphene oxide and carbonyl iron embedded in a epoxy resin. It has proven relevance due its mechanical, chemical and thermal properties but differ from each material with dielectric and magnetic properties. The research aims to carry out electromagnetic characterization of this material using techniques such as multiple scattering of incident electromagnetic wave and use of materials with intrinsic electromagnetic losses. Thus, materials comprising a polymeric matrix (epoxy resin) was obtained and additives: carbonyl iron obtained by thermal decomposition of iron pentacarbonyl with constant weight concentration (60 wt%), reduced graphene oxide by Hummer method, with the 0.1, 0.25 and 0.5 wt%. The microwave absorbing properties are measured by the transmission/reflection method using a vector network analyzer in the frequency range of 8.2 to 12.4 GHz. Electromagnetic properties such as: complex dielectric permittivity, complex magnetic permeability and reflection loss have been studied. The concentration dependence of permittivity and permeability on the frequency is analyzed. The results show that the complex permittivity spectra of the electromagnetic composite increase directly with the reduced graphene oxide weight concentration (wt%). And complex permeability spectra are nearly constant in the evaluated frequency range with value of one. The reflection loss at the peak is the maximum attenuation of the incident wave and indicates the frequency at which the material offers its optimum wave attenuation properties. The frequency of the minimum reflection loss is shifted to 12.4GHz. As the reduced graphene oxide weight concentration increases, the minimum reflection loss increases from −15dB for 0.25 wt% to −10dB for 0.5 wt%.