Proc. of the Intl. Conf. on Nanotechnology for Better Living, 2016
Editors K. K. Kar, A. Shah and R. Sharma
Vol. 3, No. 1, p. 91
doi:10.3850/978-981-09-7519-7nbl16-rps-91

Impregnated silicon carbide (SiC) as susceptor for microwave post curing of epoxy composites: effect on dielectric, thermal and mechanical properties

Ranu Pal[1], M.Jaleel Akhtar[1,2] and Kamal K.Kar[1,3*]

[1]Department of Materials Science Programme [2]Department of Electrical Engineering,
[3]Department of Mechanical Engineering,
Indian Institute of Technology Kanpur, Kanpur-208016, India
*Email: kamalkk@iitk.ac.in

Epoxy resin is a low dielectric loss material, which does not couple well with microwaves at low temperatures [1]. Materials which couple with microwaves at low temperatures, often called susceptor used as reinforcement in polymer resin to improve initial heat transfer. The ability of the materials to absorb and generate heat is largely depending on its dielectric properties especially dielectric loss or dielectric loss tangent [2]. Therefore, prior to the selection of susceptor material, determination of dielectric properties is important. In this study, three materials, Graphite, silicon carbide (SiC) and carbon graphite (CG) powder were selected as possible susceptor. The dielectric properties were measured using Cavity perturbation method (CPM) at room temperature. SiC with highest value of loss tangent chosen as our reinforcing material. Epoxy/ SiC composites with 0-40 wt% were prepared and post cured in a microwave oven for 10 min operating at 2.45 GHz. Dielectric, Thermal and mechanical analysis has to be performed on microwave cured samples.

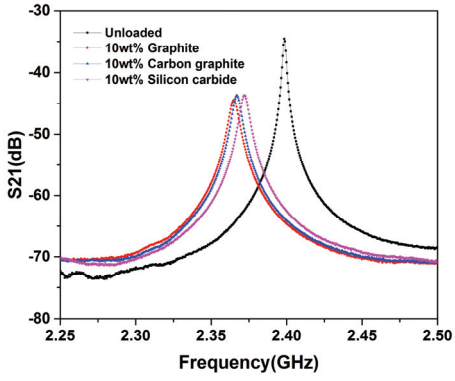

Figure 1: Measured transmission coefficients (S21) using Vector Network Analyzer at 2.45GHz

Figure 1 shows measured transmission coefficients (S21) for different types of susceptors using cavity perturbation method, while Figure 2 depicts the effect of MW curing on measured S21. In this method, S band rectangular cavity with the sample test arrangement at the center of cavity is employed. The complex dielectric properties of the samples were calculated by measuring the resonant frequency and quality factor of the rectangular cavity in the unperturbed and perturbed condition.

Table1. The real (ε') and imaginary (ε") parts of complex permittivity for different types of susceptors in epoxy resin

Samples	ε'	ε"	Tanδ(ε"/ ε')
10wt%Graphite +Epoxy	4.88	0.03	0.006
10wt%SiC +Epoxy	3.68	0.03	0.008
10wt%CG +Epoxy	4.66	0.03	0.006

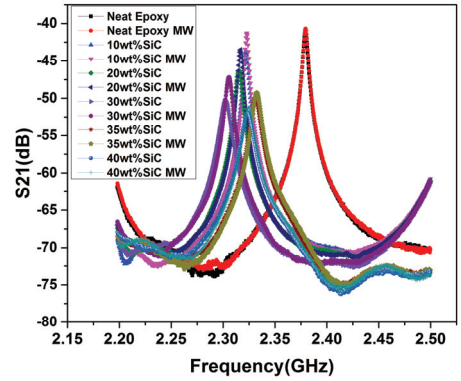

Figure 2: Effect of MW curing on measured S21

References

1. M. K. Trihotri, U. Dwivedi, F. Z. H. Khan, J. Non-cryst. Solids, 421, 2015, 1-13.
2. Venkatesh, G.S.V. Raghavan, J. Biosyst. Eng., 88, 2004,1-18

Copyright © 2016 by NBL 2016 Organizers. *Published by* Research Publishing, Singapore.