

## **Investigation into return loss characteristic of graphene oxide/zinc ferrite/epoxy composite at x-band frequency**

### **ABSTRACT**

Composite absorbing material is a branch of study that relates electromagnetic compatibility to radio and microwave frequency applications. Thus, many researchers have been made to focus on the composite fabrication and its characteristic of microwave signal performance. Generally, a light weight, high absorption and low cost absorber is highly demanded. Therefore, this work aims to investigate the return loss (RL) characteristics of graphene oxide/zinc ferrite/epoxy composite in the range of frequency 8.2 GHz to 12.4 GHz. The structural patterns of graphene oxide (GO) and Zn ferrite ( $\text{ZnFe}_2\text{O}_4$ ) were confirmed by X-ray diffraction (XRD). Surface morphologies of the composites were characterized by Coxem Table Top SEM equipped with an energy dispersive spectroscopy (EDS) system and the tracing elements were identified. The bulk density of  $\text{ZnFe}_2\text{O}_4$  could be reduced by addition of GO based on the measurement results. Electromagnetic properties were calculated using Nicolson-Ross-Weir (NRW) conversion technique based on measured S-parameters by vector network analyzer (VNA). Complex relative permittivity increases as the GO content increases due to the increment of dipolar polarization whereas a minor change occurred in permeability. Generally, the dissipation factor happens in the range of 10 – 11 GHz for both properties. A minimum RL is found to be -12.7 dB at 10.5 GHz with 2.35 mm for 3-GO- $\text{ZnFe}_2\text{O}_4$  composite sample. The RL performance of the sample could be tuned as low as -55 dB using higher thickness samples.

**Keyword:** Graphene oxide; Zinc ferrite; Composite materials; Return loss; Electromagnetic properties