

Experimental and computational study on epoxy resin reinforced with micro-sized OPEFB using rectangular waveguide and finite element method

ABSTRACT

Epoxy resin (ER) composites reinforced with micro-sized oil palm empty fruit bunch (OPEFB) were fabricated to improve the biodegradability of electromagnetic interference connector gasket. The dielectric properties, transmission coefficient $|S_{21}|$, reflection coefficient $|S_{11}|$, reflection loss, power loss and shielding effectiveness were studied at a frequency range of 8–12 GHz. OPEFB–ER composites were prepared by varying the percentages of OPEFB (0, 5, 10, 15, 20, 25, 30 and 40%) at room temperature ($25^{\circ}\text{C} \pm 2$). Dielectric constant (ϵ'), loss factor (ϵ''), reflection and transmission coefficients of the composites were measured using rectangular waveguide connected to vector network analyser. In addition, ϵ' and ϵ'' were used in finite element method technique to obtain $|S_{11}|$ and $|S_{21}|$. The results showed that the dielectric properties increased but $|S_{11}|$ and $|S_{21}|$ decreased with increasing OPEFB percentage in the composites. The shielding effectiveness, power loss and reflection loss increased with increasing OPEFB percentage in the composites. The simulated and measured results of $|S_{11}|$ and $|S_{21}|$ were in good agreement.