

**THE DIELECTRIC CONSTANT ( $\epsilon_r = \epsilon'_r - j\epsilon''_r$ ) AND LOSS  
TANGENT ( $\tan \delta = \epsilon''/\epsilon'$ ) OF DIFFERENT THICKNESSES OF 70%  
THERMOPLASTIC NATURAL RUBBER - 30% MAGNETITE  
( $\text{Fe}_3\text{O}_4$ ) COMPOSITE**

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## ABSTRACT

### THE DIELECTRIC CONSTANT ( $\epsilon_r = \epsilon'_r - j\epsilon''_r$ ) AND LOSS TANGENT ( $\tan \delta = \epsilon''/\epsilon'$ ) OF DIFFERENT THICKNESSES OF 70% THERMOPLASTIC NATURAL RUBBER - 30% MAGNETITE ( $\text{Fe}_3\text{O}_4$ ) COMPOSITE

A thermoplastic natural rubber (TPNR) was prepared by melt-blending of polypropylene (PP) and natural rubber (NR) in percentage weight ratio of 70:30 using an internal mixer. Samples of TPNR filled with same proportion of magnetite powders were similarly prepared at a fixed TPNR (70% of the total weight). The pure TPNR and different thickness of TPNR filled magnetite was prepared by using hot press process. The dielectric constant and tangent loss of sample with different thicknesses were studied. The thermogravimetric analysis (TGA) was used to check the homogeneity of the filler dispersion in the matrix of TPNR and vector network analysis used to study the dielectric constant and loss tangent. In thermogravimetric analysis, the sample was confirmed homogenous according to TGA results. The dielectric constant,  $\epsilon'$  and loss tangent,  $\epsilon''/\epsilon'$  were studied by using vector analysis in frequency range 8GHz-12GHz. The values of  $\epsilon'$  and  $\epsilon''/\epsilon'$  of the composites are almost comparable to each other in the measured frequency region. For dielectric constant, the 2mm thickness TPNR filled with magnetite has the highest reading which is 2.077019064 followed by the TPNR filled magnetite 5mm is 1.498707921 and the pure TPNR is 1.371611802 in the frequency range 8GHz-12GHz. For loss tangent, TPNR filled magnetite 2mm thickness has the lowest reading which is -0.033864351 followed by the TPNR filled magnetite 5mm is -0.020930693 and the pure TPNR is -0.017549753 in the frequency range 8GHz-12GHz. The incorporation of pure TPNR and the different thickness of TPNR filled magnetite has resulted differences in dielectric constant, loss tangent and microwave properties of the composites. These composites can be developed as an electromagnetic wave absorber.

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