

# Complex permittivity and permeability characterization of Expanded graphite- Fe<sub>3</sub>O<sub>4</sub>-White Cement based magneto-dielectric nanocomposite for X band microwave absorption

Bidyut B Saikia<sup>1,4</sup>, Nabajyoti saikia<sup>2</sup>, Jyoti Prasad Gogoi<sup>3</sup> and Prince K Mochahari<sup>4</sup>

<sup>1</sup>Department of Physics, C N B College, Bokakhat 785612, India

<sup>2</sup>Department of Chemistry, Kaziranga University, Jorhat 785006, India

<sup>3</sup>Department of Physics, D K D College, Dergaon 785614, India

<sup>4</sup>Department of Physics, Bodoland University, Kokrajhar 783370, India

E-mail: sbidyutbikash@gmail.com

## Abstract:

Anechoic chamber used for testing of microwave absorption of devices basically designed by incorporating absorbing materials on the walls of a concrete structure. In this present investigation, a cement based composite embedded with expanded graphite and Fe<sub>3</sub>O<sub>4</sub> filler has been characterized for complex permittivity and permeability in the frequency range 8.2 to 12.4 GHz by using Nicolson and Ross method employing Agilent 85071E material measurement software. Initially, Fe<sub>3</sub>O<sub>4</sub> filler materials were synthesized by co-precipitation method and mixed with Expanded Graphite (EG) and White Cement in different wt. % and characterize for microwave properties in the frequency range. SEM characterization for Fe<sub>3</sub>O<sub>4</sub> particle found to be of size 30 nm. The complex permittivity( $\epsilon_r$ ) and permeability( $\mu_r$ ) values showed an increasing trend with increases in filler wt. % with maximum  $\epsilon_r = 18 - j10$  and ( $\mu_r = 1.5 - j0.35$ ) for 40 wt. % composition which indicates its suitability for application in preparing walls of Anechoic chamber.

**Keywords:** Complex permittivity and permeability, expanded graphite, Ferrite

## References:

- [1] Celzard A., Marech<sup>^</sup>e, J. F., Furdin, G. and Puricelli, S. Electrical conductivity of anisotropic expanded graphite-based monoliths, J. Phys. D: Appl. Phys 33, 3094-3101, 2000
- [2] Cullity, B. D. Elements of X-ray diffraction, Addison Wesley, Massachusetts, 1978.
- [3] Oikonomou, A., Giannakopoulou, T., and Litsardakis, G. Design, fabrication and characterization of hexagonal ferrite multi-layer microwave absorber, Journal of Magnetism and Magnetic Materials 316(2), e827–e830, 2007