Electronic Supplementary Material (ESI) for RSC Advances.

Improved microwave absorption in light weight resin based carbon foam by decorating with magnetic and dielectric nanoparticles

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Figure S1, SEM image of CFoam C2 coated with the ferrofluid and heat treated at 650^{O}C in inert atmosphere. It is observed that during heat treatment due to the evaporation of solvent and surfactant, Fe_3O_4 nanoparticles are agglomerated and continuous coating is form on the surface of the CFoam (Figure S1 a). Due to the mismatch of coefficient of thermal expansion between carbon foam and Fe_3O_4, the cracks are generated in coating on CFoam shown in Figure S1 (c).

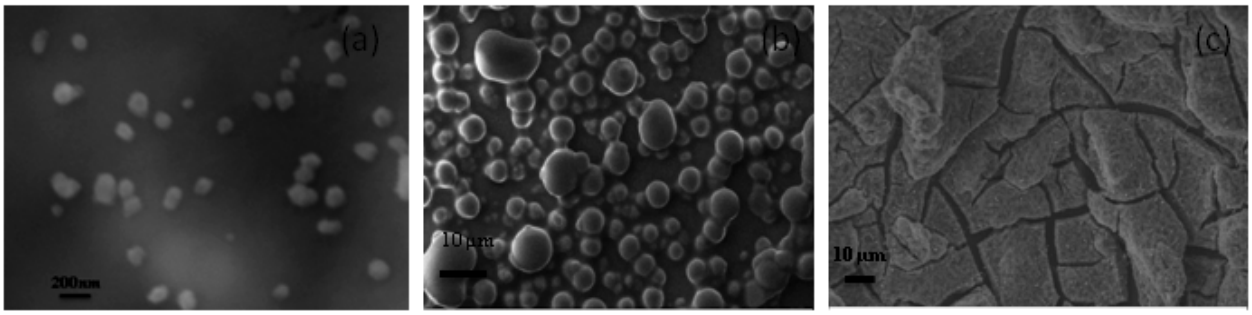

Figure S1 : SEM image of (a) ferrofluid nanoparticles, (b) agglomerated ferrofluid (c) Fe_3O_4 coating on CFoam having cracks.

Figure S2 depicted the ZnO particle synthesized by thermal evaporation of zinc acetate at low temperature 60-70 °C (Figure S2 a). The ZnO nanoparticles with ferrofluid solution coated on CFoam and heat treated at 650°C. The Fe_3O_4 coated on the mostly on the surface of CFoam while some Fe_3O_4 nanoparticles and ZnO impregnated mostly in the pores of CFoam. After heat

treatment, it is observed that flower type morphology of ZnO and Fe_3O_4 in the powder form inside the pores (Figure S2 b, c and d).

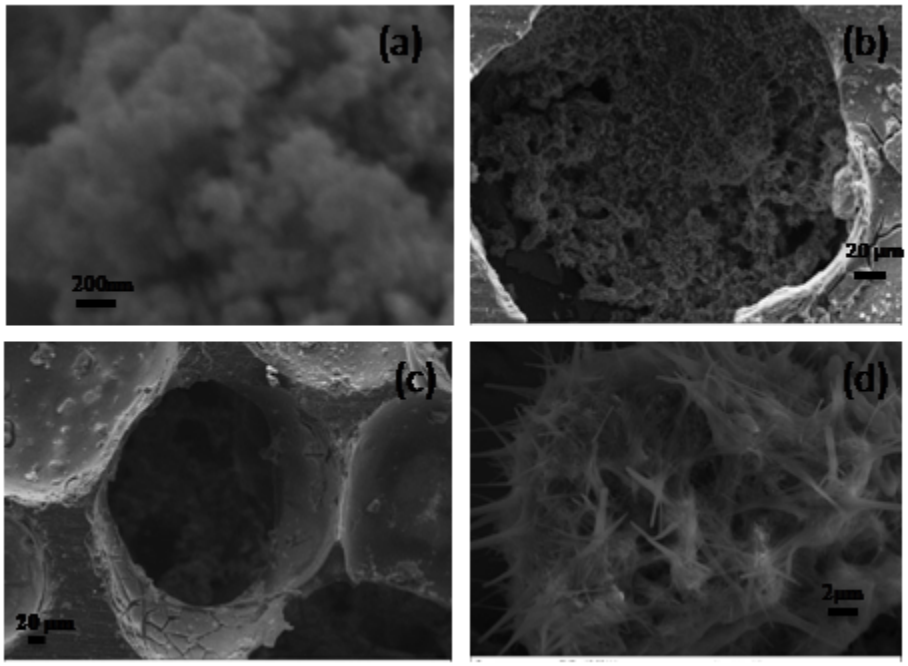

Figure S2: SEM image of ferrofluid and ZnO nanoparticles synthesized in the laboratory.

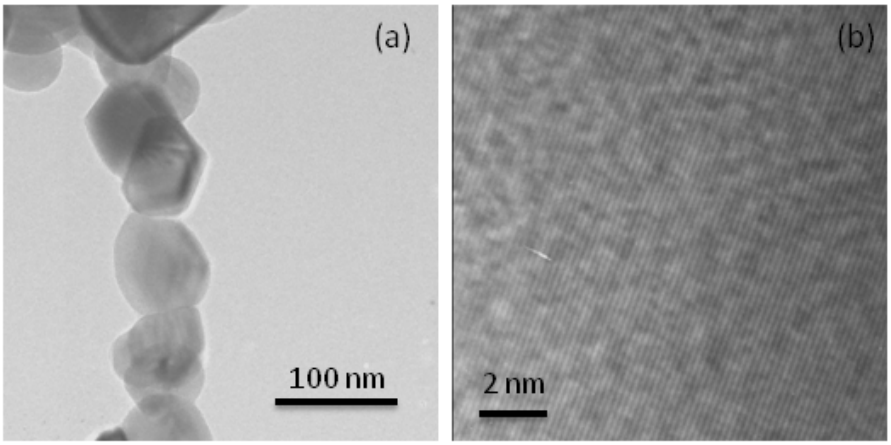

Figure S3: TEM image of ZnO nanoparticles synthesized by thermal evaporation technique.

Figure S3a is TEM image of ZnO nanoparticles which are of different shape and size. The particle size is in between 60-70 nm. Figure S3 b shows the repeated fringes indicate the nonorod type morphology of ZnO after heat treatment at 650^{O}C.

Figure S4 shows the X-ray diffraction spectra of ferrofluid and ZnO. The X-ray diffraction pattern of ferrofluid is characteristic of magnetite (Fe_3O_4). It is a colloidal suspension of magnetic particles into a carrier liquid by utilizing surfactant to create a colloidal suspension. The surfactants are dispersion agents for particles in a liquid that work by adhering to the particles and creating a net repulsion between them. In particular peaks at 2θ equal to 30.2, 35.6, 43.2, 53.7, 57.1 and 62.8 (Figure S4 curve a) are index as 220, 311, 400, 511 and 440 lattice planes of cubic magnetite (JCPDS19-629). The peak at 35.66 and 62.8 is due to the Fe-O. Figure S4 (curve of ZnO) is X-diffraction pattern of ZnO. In the spectra peaks at 2θ equal to 31.8, 34.5, 36.4, 47.6, 56.4, 62.9, 68.0 are corresponds to 100,002,101,102,110, 103, 200 lattice planes of wurtzite ZnO structure.

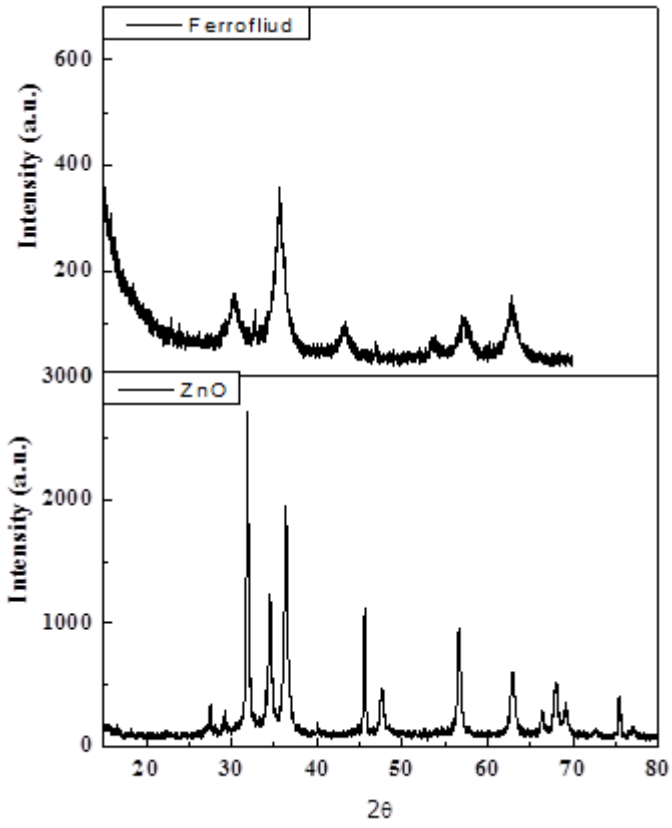

Figure S4: X ray diffraction pattern of Fe_3O_4 and ZnO nanoparticles.