

Solvothermal synthesis of three-dimensional, Fe₂O₃ NPs embedded
CNT/N-doped graphene composites with excellent microwave
absorption performance

Nan Zhou ^a, Qingda An ^{a,*}, Zuoyi Xiao ^a, Shangru Zhai ^{a,*}, Zhan Shi ^b

^a *Faculty of Light Industry and Chemical Engineering, Dalian Polytechnic University,
Dalian 116034, China*

^b *State Key Laboratory of Inorganic Synthesis and Preparative Chemistry, College of
Chemistry, Jilin University, Changchun 130012, China*

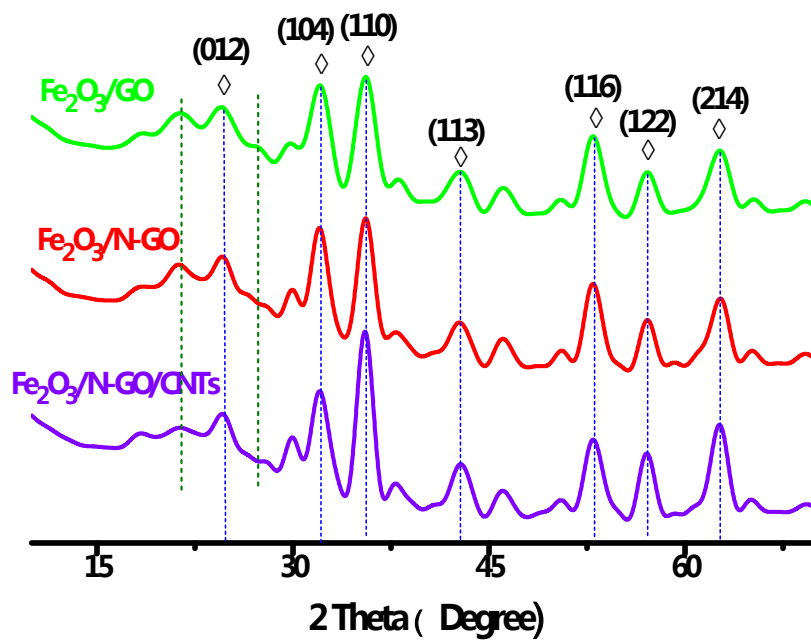
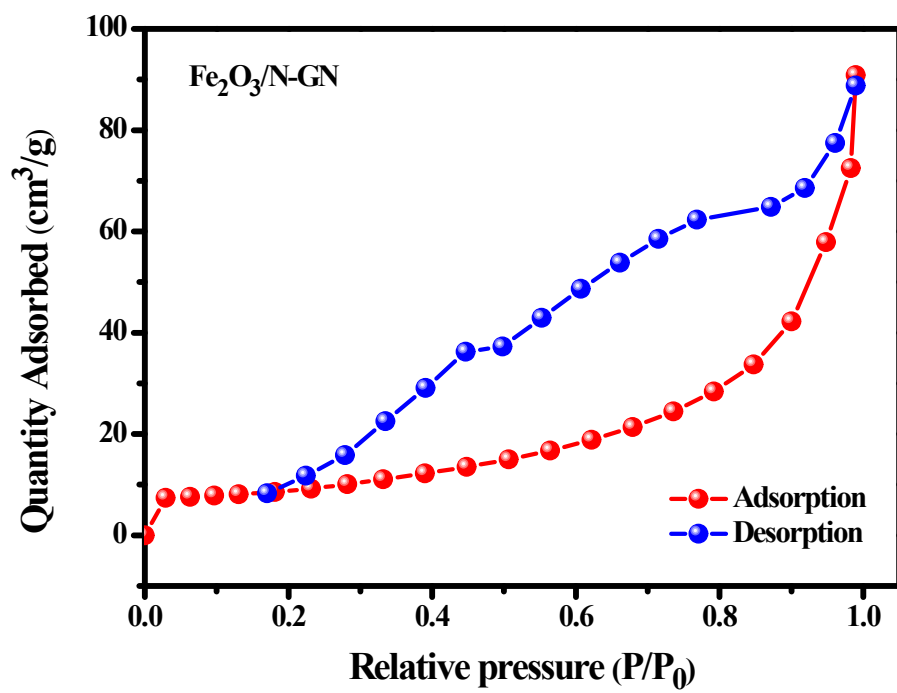


Fig. S1. XRD patterns of $\text{Fe}_2\text{O}_3/\text{GN}$, $\text{Fe}_2\text{O}_3/\text{N-GN}$ and $\text{Fe}_2\text{O}_3/\text{N-GN/CNTs}$ composites
percentage at $2\theta=10-70^\circ$.



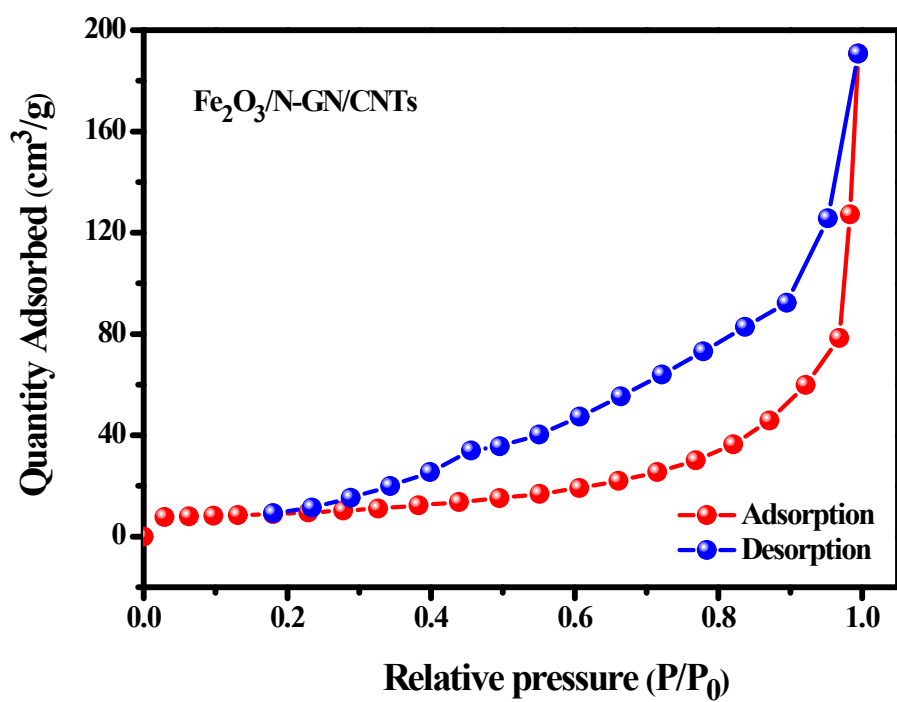


Fig. S2. Adsorption-desorption isotherms of Fe₂O₃/N-GN and Fe₂O₃/N-GN/CNTs composites

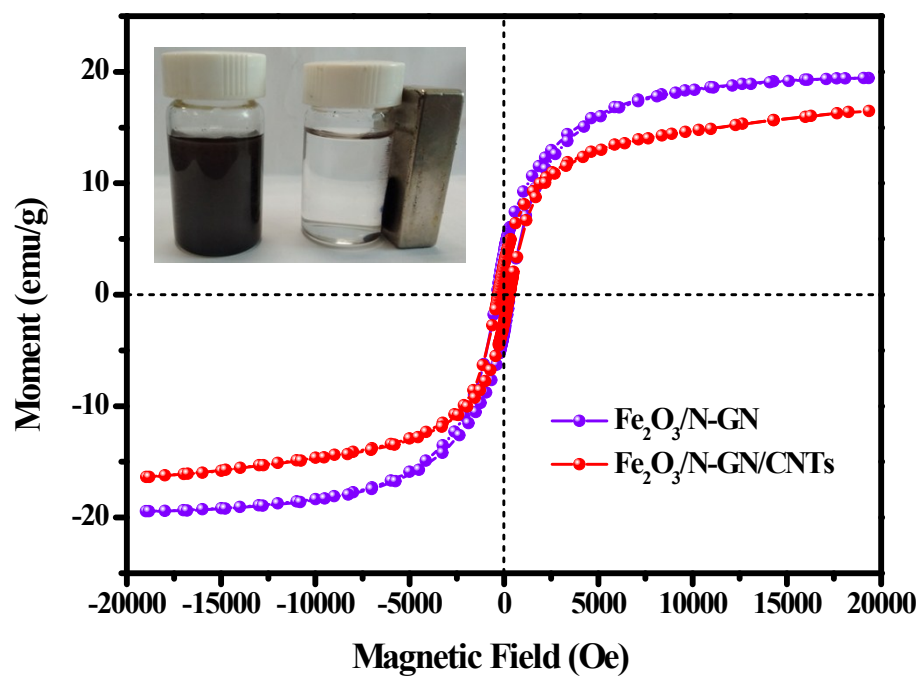


Fig. S3. VSM curve of Fe₂O₃/N-GN and Fe₂O₃/N-GN/CNTs.

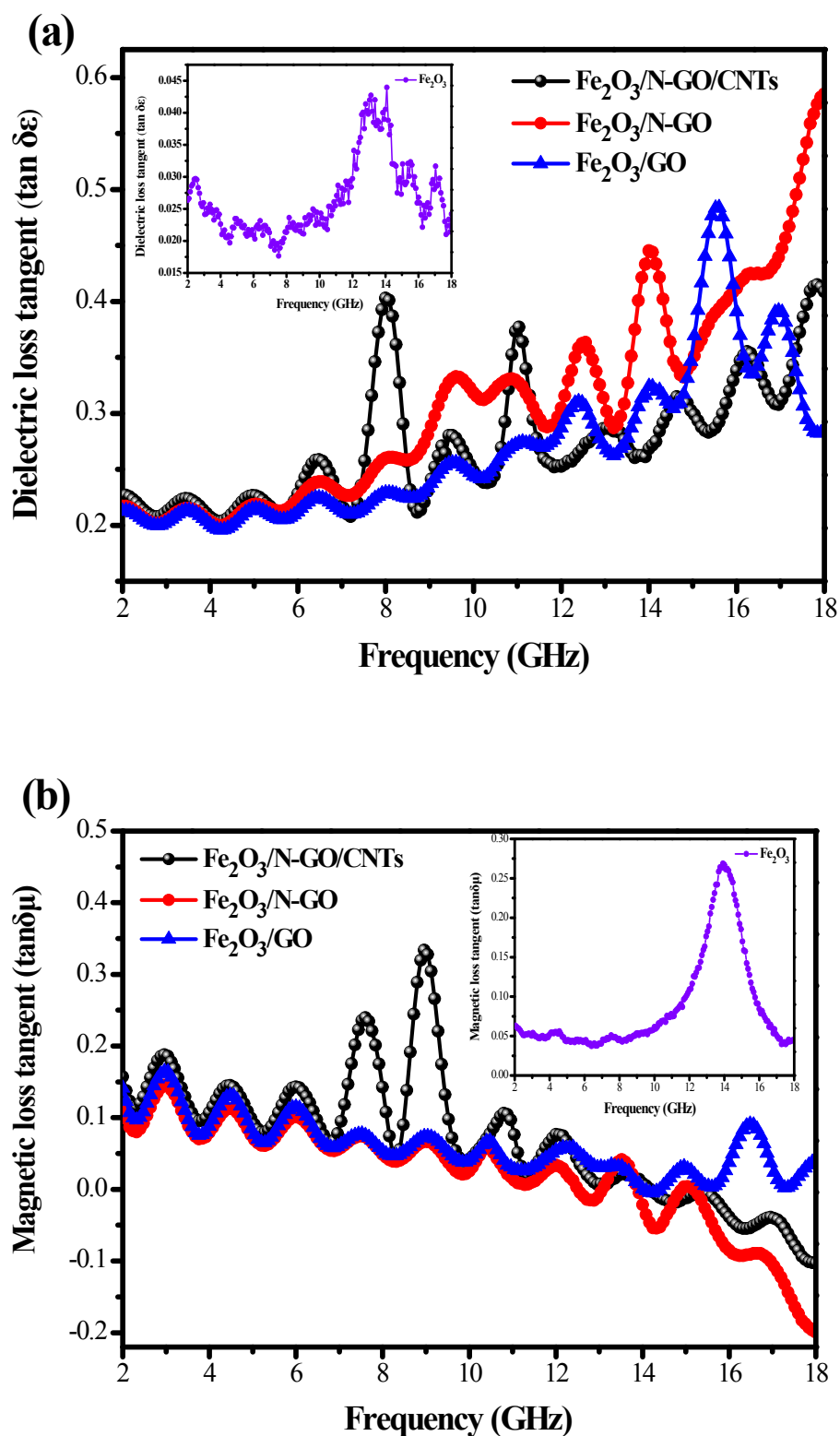


Fig. S4. (a) Dielectric loss tangents ($\tan \delta\epsilon$) and (b) magnetic loss tangents ($\tan \delta\mu$) of $\text{Fe}_2\text{O}_3/\text{GN}$, $\text{Fe}_2\text{O}_3/\text{N-GN}$ and $\text{Fe}_2\text{O}_3/\text{N-GN/CNTs}$ composites

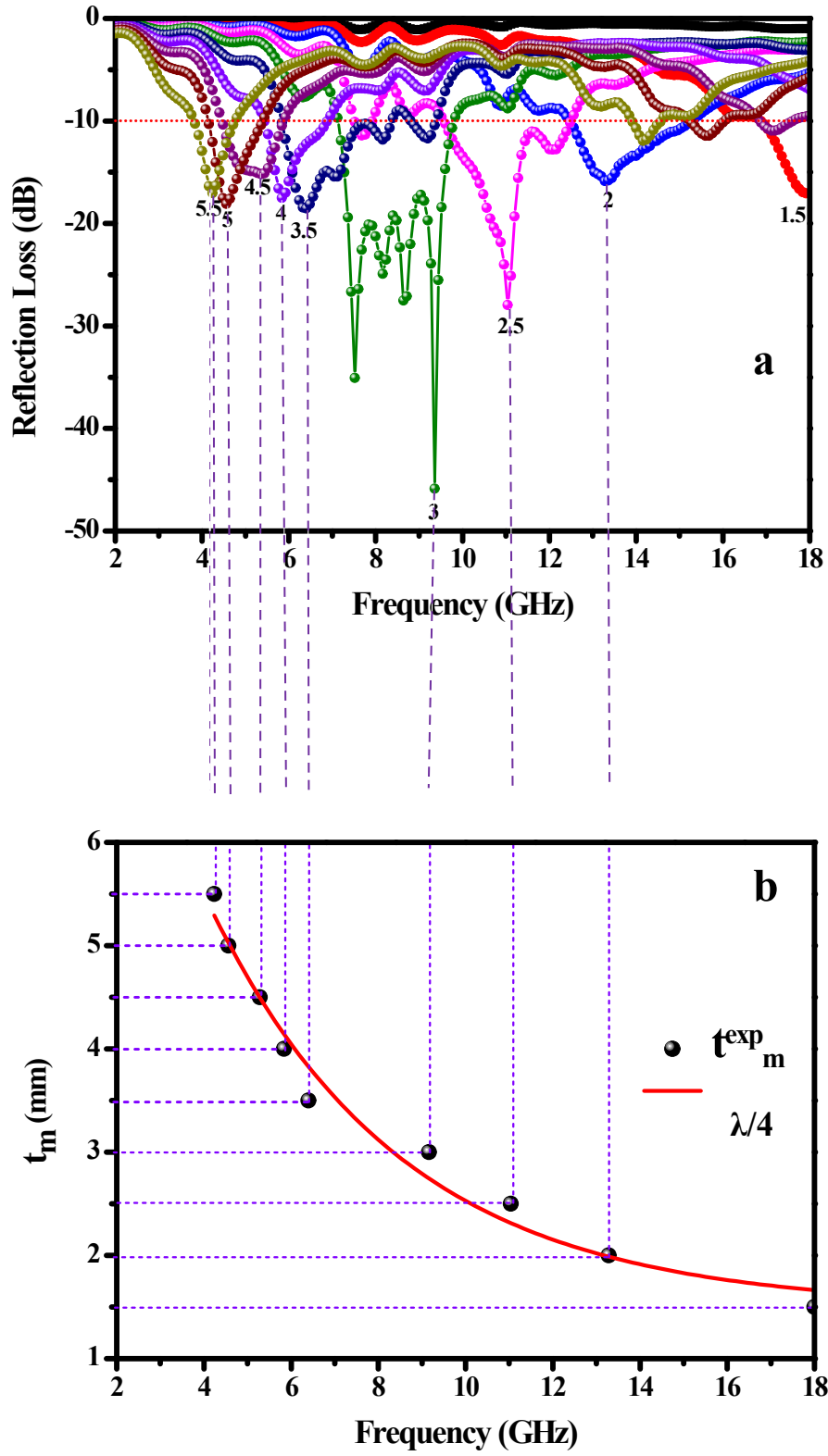


Fig. S5. (a) Reflection losses curves for sample $\text{Fe}_2\text{O}_3/\text{N-GN/CNTs}$, (b) dependence of matching thickness (t_m) on matching frequency(f_m)of composites at wavelength of

$$\lambda/4.$$

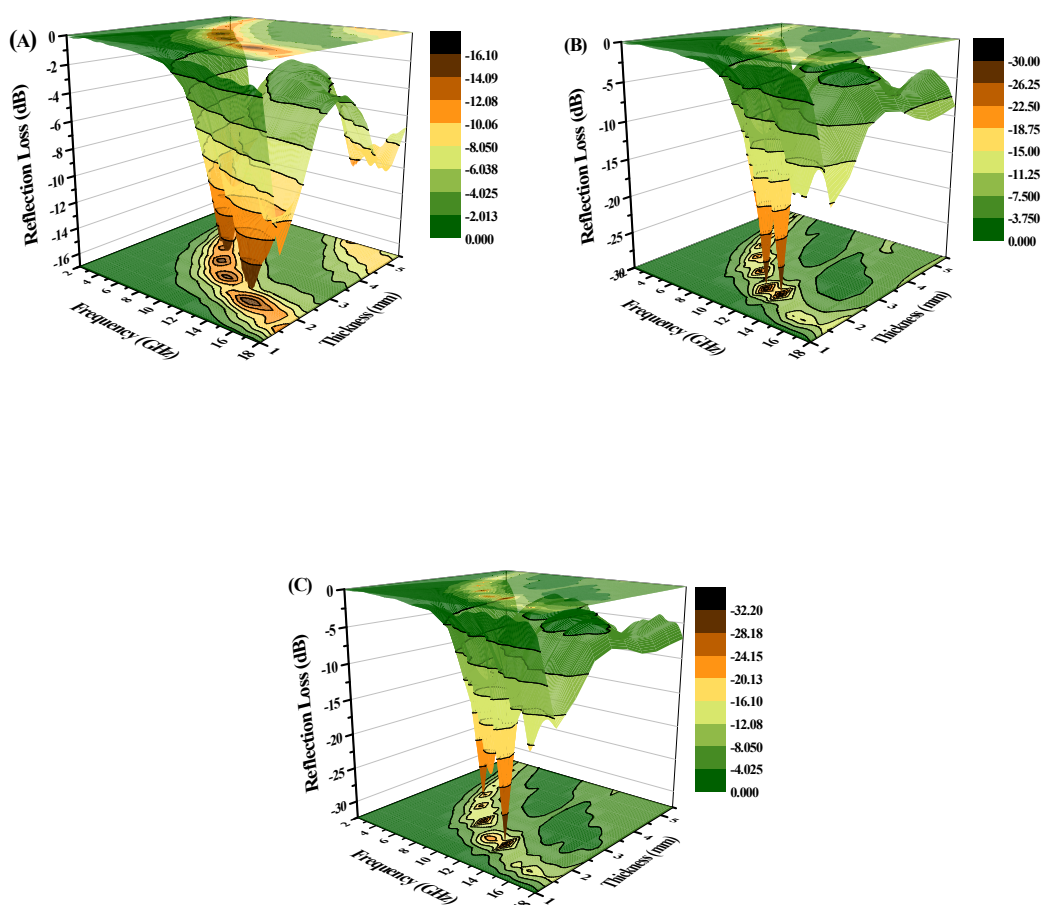


Fig. S6. Three-dimension images of calculated RL values of (A) 1.5a-Fe₂O₃/N-GN/CNTs (a refer to the amount of initial iron salt added), (B) Fe₂O₃/N-GN/CNTs-1.5b (Fig. S6(B)) (b refer to the amount of initial CNTs added) and (C) Fe₂O₃/1.5c-N-GN/CNTs (Fig. S6(C)) (c refer to the amount of initial urea added).

Elements at. %	Binding			
/Chemical group	Energy (eV)	GN %	Fe ₂ O ₃ /N-GN %	Fe ₂ O ₃ /N-GN/CNT %
C 1s	--	95.4	63.9	70.5
O 1s	--	4.6	1.65	2.6
Fe 2p	--	--	26.9	21.68
N 1s	--	--	7.54	4.42
C-N	285.7	--	19.64	15.37
C-O	286.5	--	14.34	11.28
O-C=O	289.8	--	6.5	4.42
C=C (sp ²)	284.7	56.7	27.87	33.56
C-C (sp ³)	285.3	43.3	31.65	35.37
sp ² /sp ³	--	1.31	0.881	0.949

Table S1 Table shows atomic composition of GN, Fe₂O₃/N-GN and Fe₂O₃/N-GN/CNT composites and content of C 1s chemical groups resulting from spectra fitting.