Supporting Information

Arc-discharge Synthesis of Nitrogen-doped C Embedded TiCN Nanocubes with Tunable Dielectric/Magnetic Properties for Electromagnetic Absorbing applications

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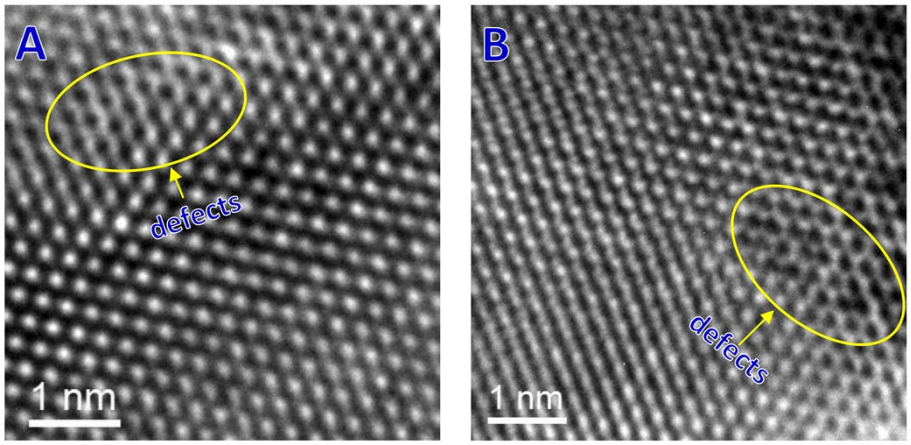

Figure S1. HRTEM images of TiCN@C-2 prepared at 33.3 vol.% of N_2 (**A** and **B**), in which the prominent lattice defects can be found easily.

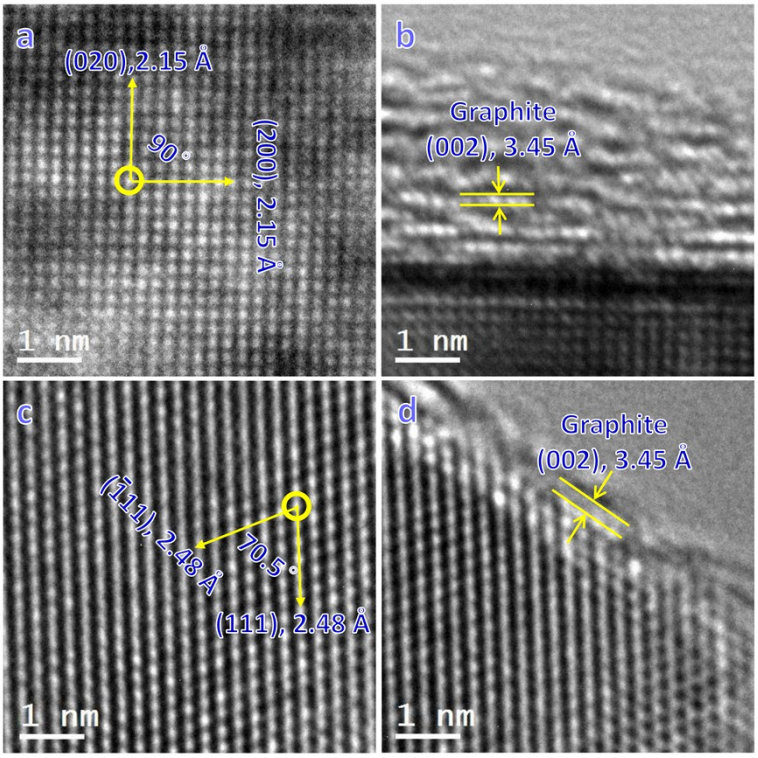

Figure S2. HRTEM images of TiCN@C-1 prepared at 16.7 vol.% of N_2 (a, b), TiCN@C-3 prepared at 41.7 vol.% of N_2 (c, d).

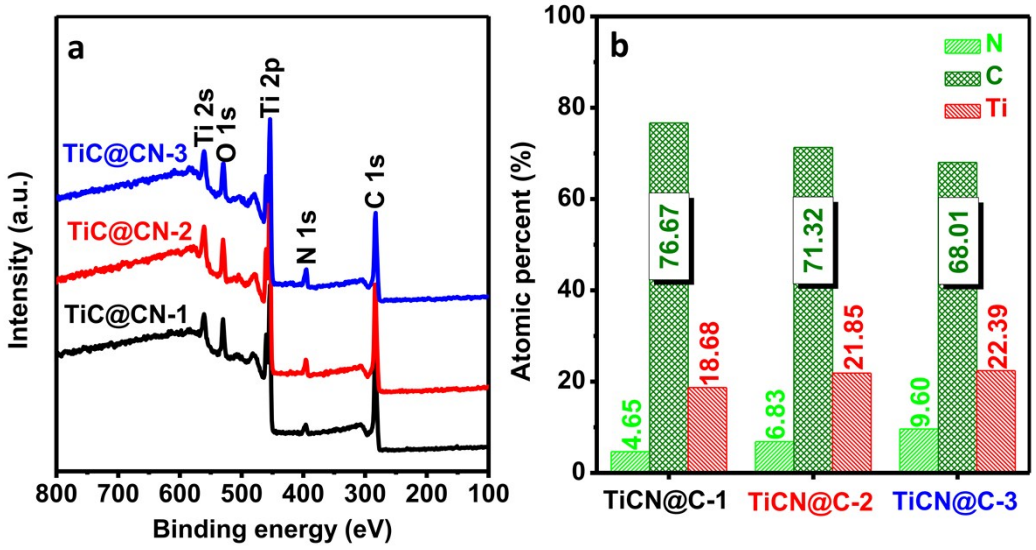

Figure S3. (a) X-ray photoelectron spectra and (b) atomic percentage of N, C and Ti of the three TiCN@N-doped C nanocubes prepared at different N_2 concentration.

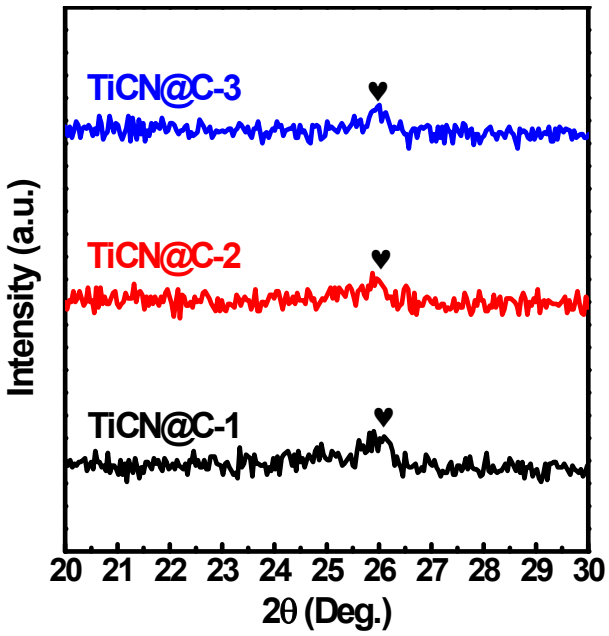

Figure S4. Enlarged XRD patterns from 20° to 30° of the as-made nanocubes TiCN@C-1 (black), TiCN@C-2 (red) and TiCN@C-3 (blue).

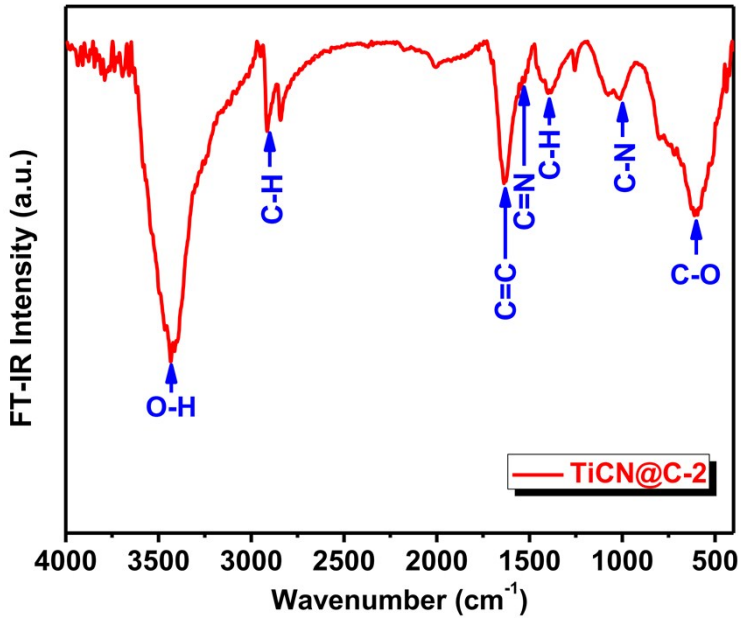

Figure S5. FT-IR spectrum of the sample TiCN@C-2 prepared at 33.3 vol.% of N_2.

Due to their similar chemical components and microstructures of the three as-synthesized samples, the representative sample TiCN@C-2 was selected to conduct the Fourier Transform Infrared (FT-IR) spectrum to reveal its surface functional groups. As shown in Figure S5, the broad peak located at 3446.87 cm^{-1} indicates the existence of O-H stretching vibrations.[1] The peaks at 1630.96, 1538.25, 996.15, 586.56 cm^{-1} are separately attributed to C=C, C=N, C-N and C-O stretching vibrations, while bands of 2916.33 and 1384.68 cm^{-1} are assigned to C-H bonds.[2]

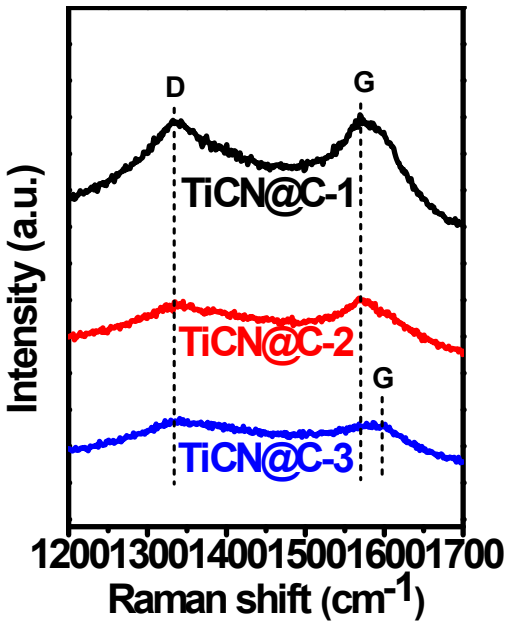

Figure S6. Enlarged Raman spectra of the as-made nanocubes TiCN@C-1, TiCN@C-2 and TiCN@C-3 within the Raman shift from 1200 to1700 cm^{-1}.

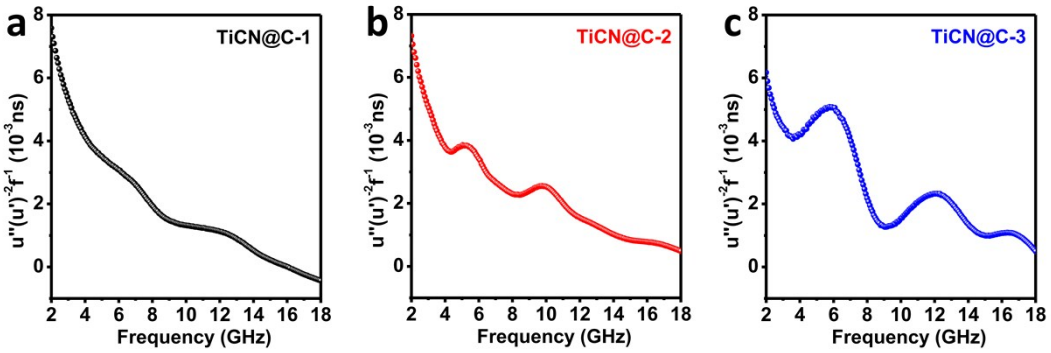

Figure S7. The measured frequency dependence of the C_0 ($C_0=\mu''(\mu')^{-2}f^{-1}$) values of (a) TiCN@C-1, (b) TiCN@C-2 and (c) TiCN@C-3, respectively.

References

1. D. S. Geng, S. L. Yang, Y. Zhang, J. L. Yang, J. Liu, R. Y. Li, T. K. Sham, X. L. Sun, S. Y. Ye and S. Knights, *Applied Surface Science*, 2011, **257**, 9193-9198.
2. H.W. Zhang, Y.Y. Li, W.Q. Huang, B.-X. Zhou, S.-F. Ma, Y.-X. Lu, A.-L. Pan and G.-F. Huang, *Carbon*, 2019, **148**, 231-240.