Supplementary Information (SI) for Journal of Materials Chemistry A.

Micro-marco synergistic regulation of Co-N-C bond and dielectric-magnetic-dielectric sandwich structure for promoting broadband microwave absorption

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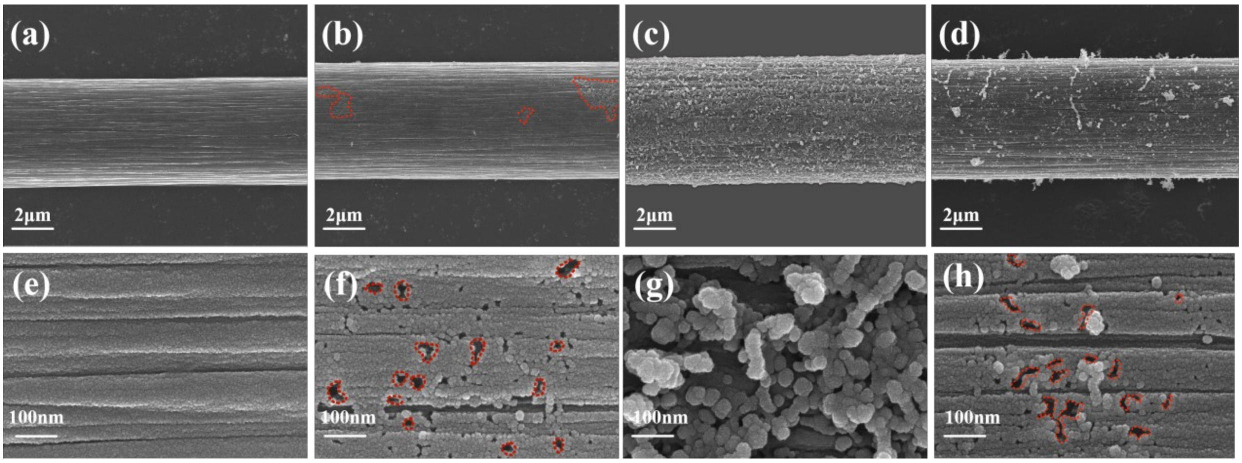

Fig.S1 (a-h) SEM images of CF, Co/N@CF-0.1, Co/N@CF-0.2, Co/N@CF-1

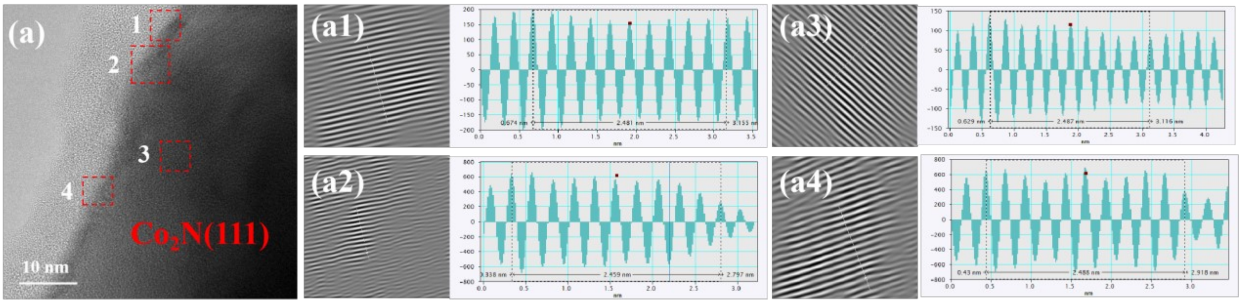

Fig.S2. TEM and HR-TEM image of Co/N@-0.2

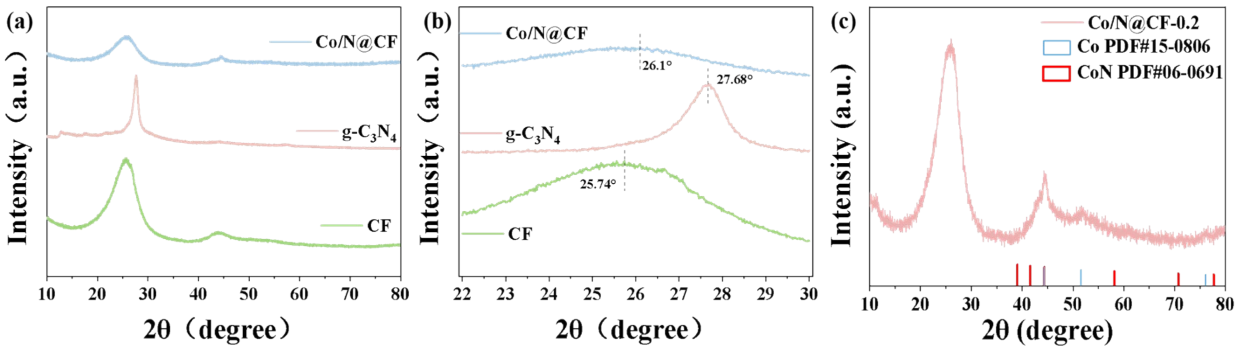

Fig.S3. (a) XRD plots of CF, g-C3N4, and Co/N@CF (b) XRD local magnification plots of CF, g-C3N4, and Co/N@CF (c) PDF standard comparison card of XRD for Co/N@CF-0.2

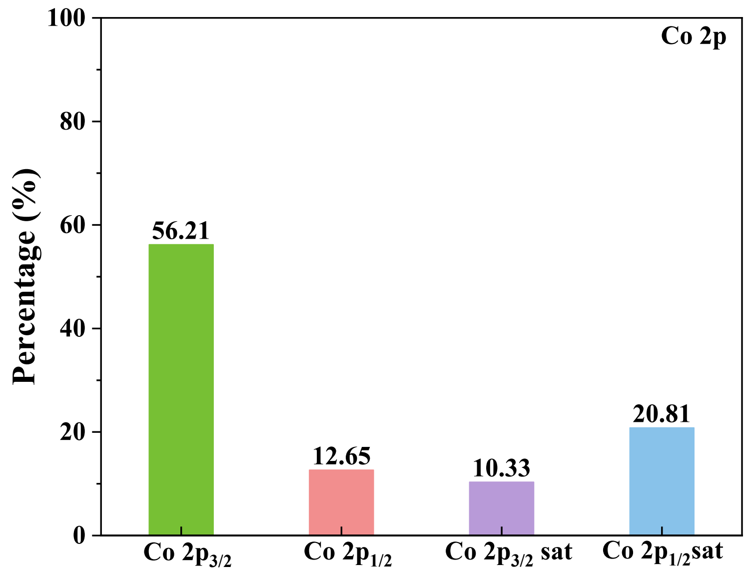

Fig.S4. Comparison of the content of Co 2p XPS fitted peaks of the composite Co/N@CF

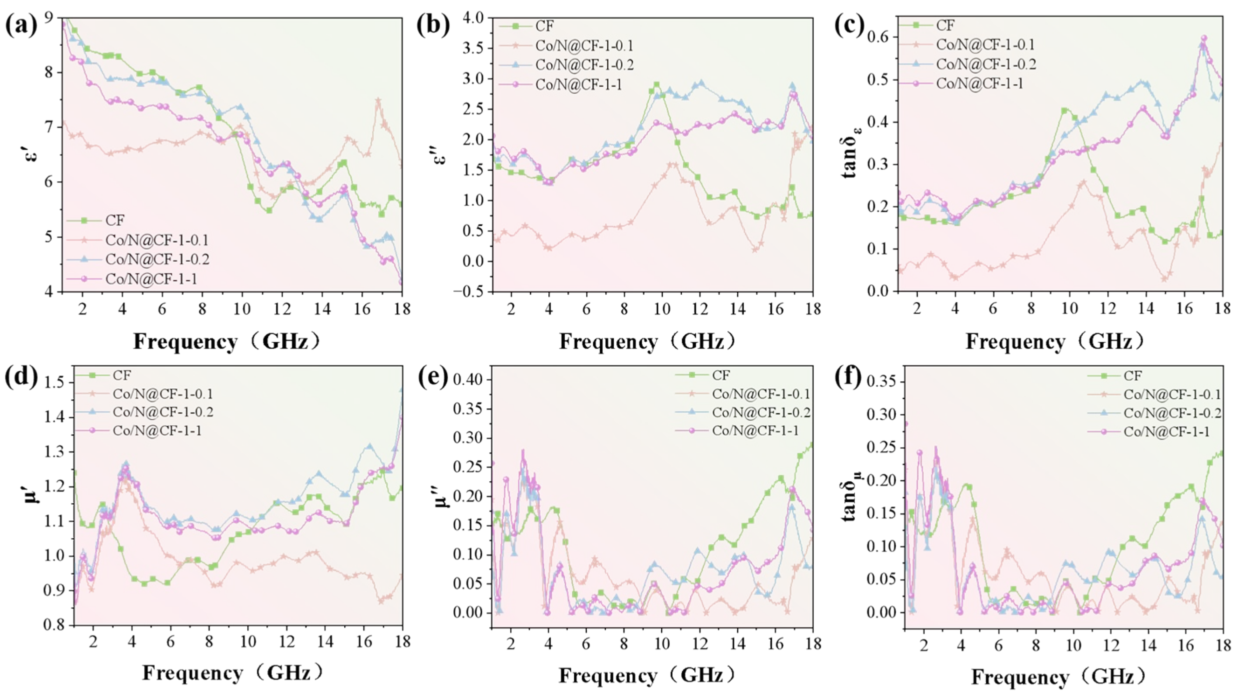

Fig.S5. CF、Co/N@CF-1-0.1、Co/N@CF-1-0.2、Co/N@CF-1-1 (a, b) ε′ and ε″ of the complex dielectric constant, (c) $\tan\delta_\varepsilon$, (d, e) μ′ and μ″ of the relative magnetic permeability, (f) $\tan\delta_\mu$

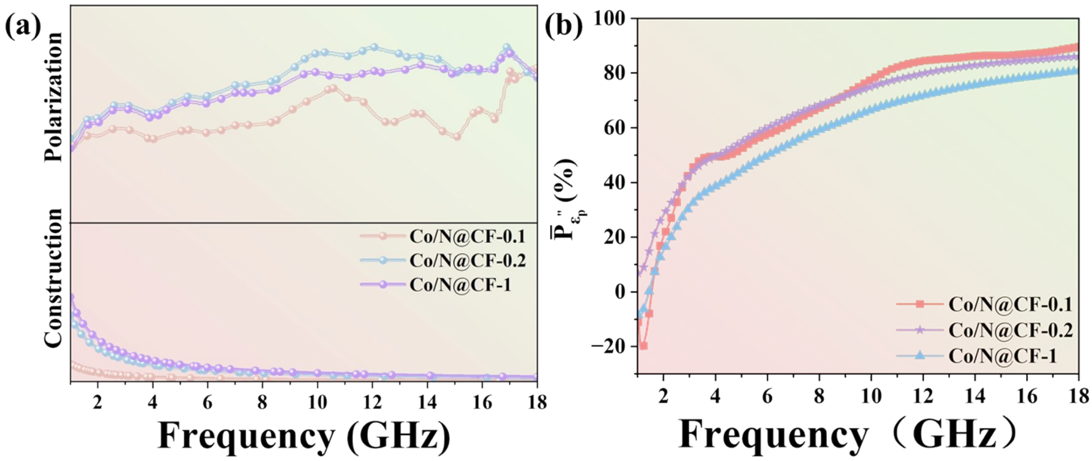

Fig.S6 Co/N@CF-0.1, Co/N@CF-0.2 and Co/N@CF-1 (a)The calculated polarization loss ε_p'' and conductivity loss ε_c'' (b)The average contribution curve of polarization loss within 1-18GHz.

Fig. S7 shows the relationship between $\varepsilon'$and ε''/f values and the relaxation time statistics of all samples. According to the Debye relaxation equation, the real and imaginary parts of the permittivity can be obtained from the equation:

$$\varepsilon' = \varepsilon_\infty + \frac{\varepsilon_s - \varepsilon_\infty}{1+\omega^2\tau^2}$$

$$\varepsilon'' = \frac{\omega\tau(\varepsilon_s - \varepsilon_\infty)}{1+\omega^2\tau^2}$$

In this context, ε_s and ε_∞ represent the static permittivity and the permittivity at infinite frequency, respectively; ω and τ denote the angular frequency and relaxation time, respectively. By rearranging Equations, the number of Debye relaxation processes and the corresponding Debye relaxation frequencies (f_d=1/2πτ) can be roughly estimated as follows:

$$\varepsilon' = \varepsilon_\infty + \frac{\varepsilon''}{\omega\tau} = \varepsilon_\infty + \frac{\varepsilon''}{2\pi f\tau}$$

From the aforementioned equations, it can be observed that during Debye relaxation, the connection between ε' and ε''/f is represented by a straight line with a slope of 1/2πτ, enabling the calculation of the relaxation time τ for polarization relaxation.

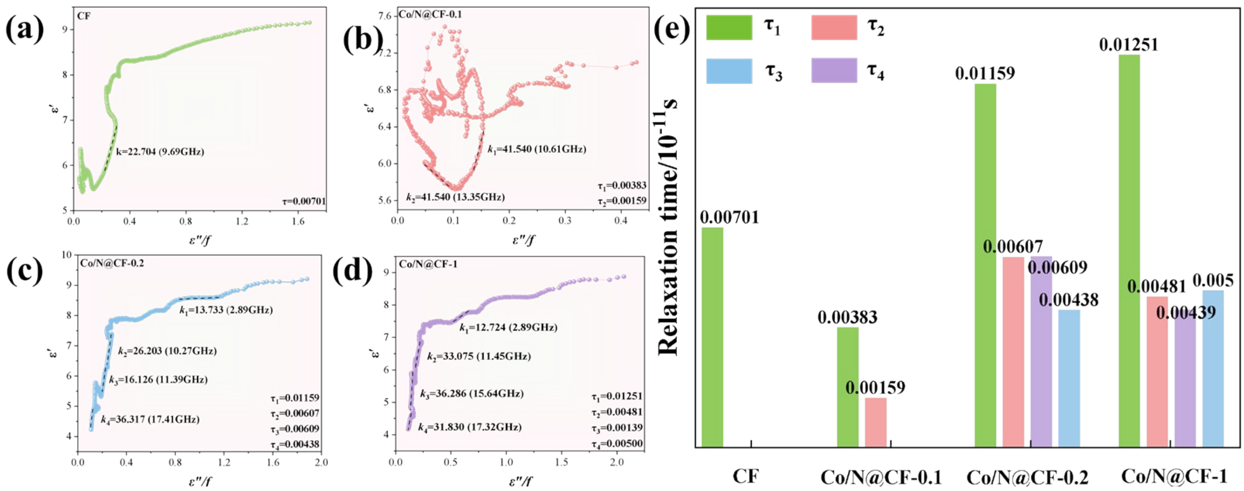

Fig.S7 (a-d) the relationships between ε' and ε''/f values for CF, Co/N@CF-0.1, Co/N@CF-0.1, and Co/N@CF-0.1, (e) a statistical of the relaxation times for all samples