Supporting Information

Plasma-assisted doping scenario of pyrolyzed corn husk strengthened by MoS_2/polyethersulfone for fascinating microwave absorbing/shielding and energy saving properties

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1. Characterization

1. 1. BET and BJH parameters

Table S1. The specific surface area and pore parameters of the nanoparticles

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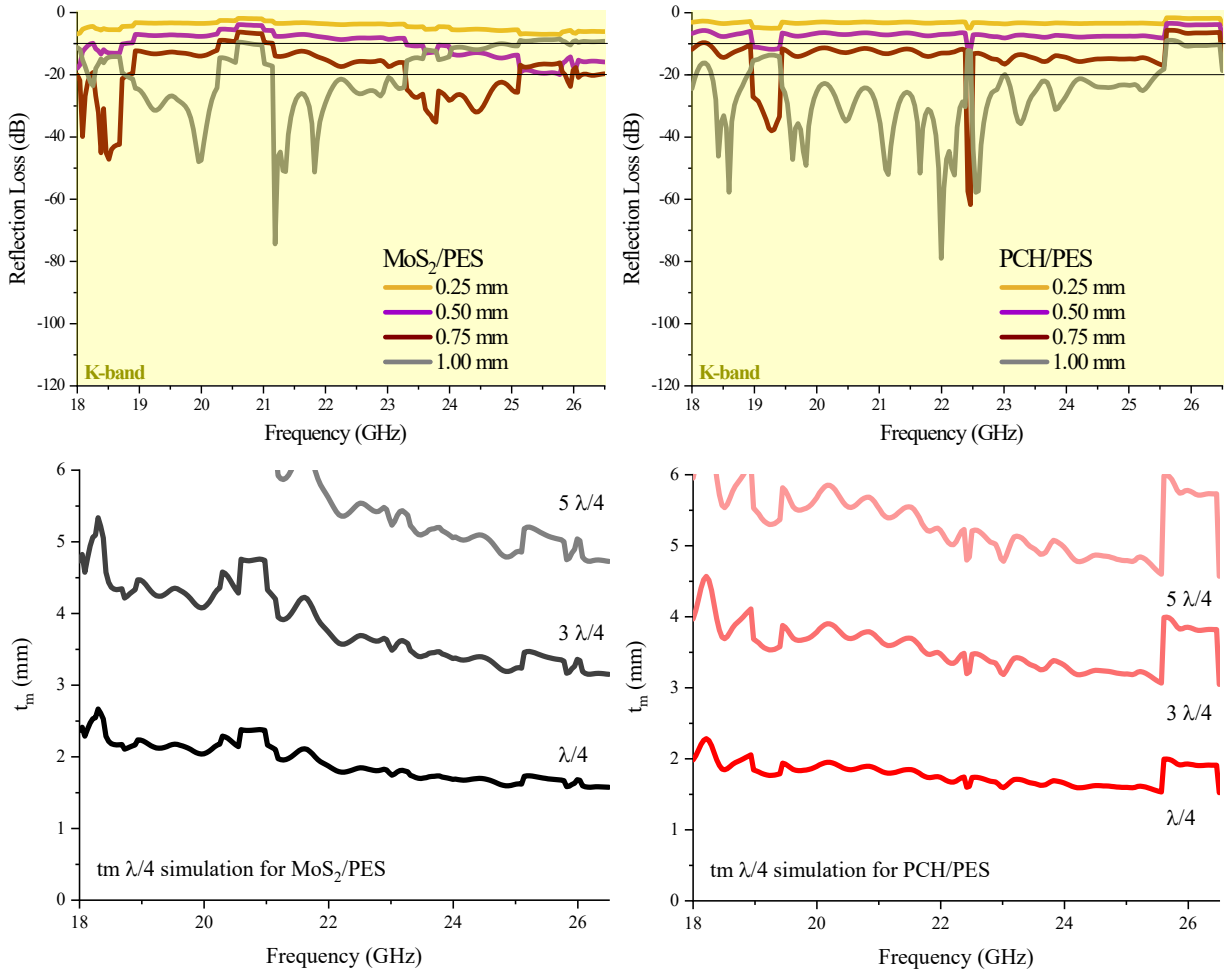
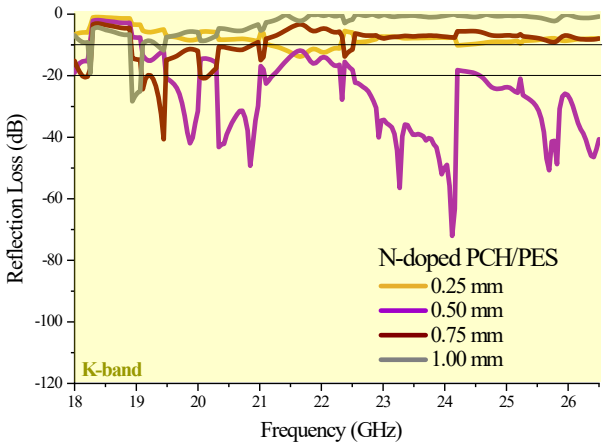
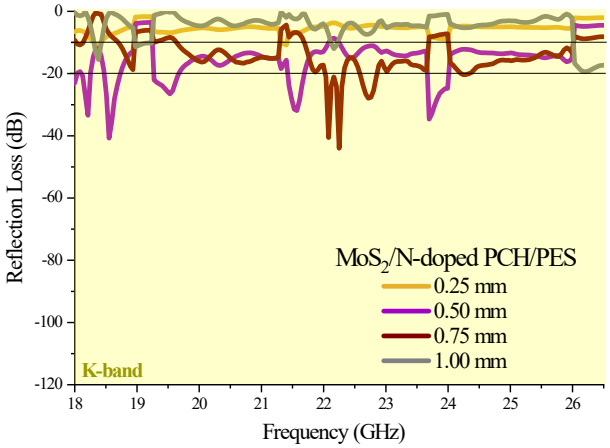
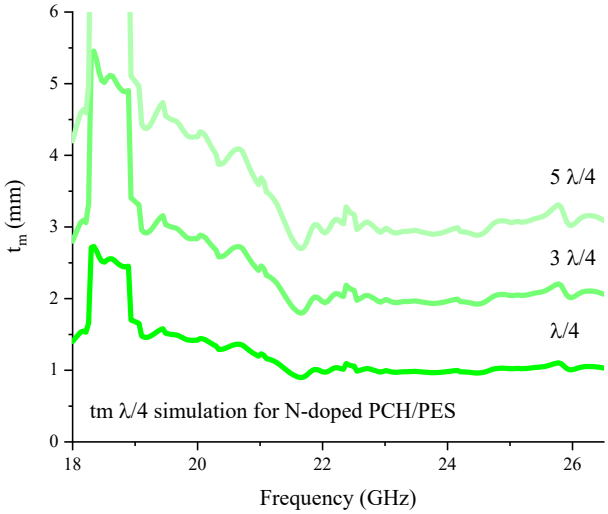
Entry	Sample	Specific surface area (m^2/g)	Average pore diameter (nm)	Pore volume (cm^3/g)
1	PCH	2.536	3.72	0.0111
2	N-doped PCH	20.253	2.42	0.016
3	MoS_2/N-doped PCH	11.709	3.28	0.046

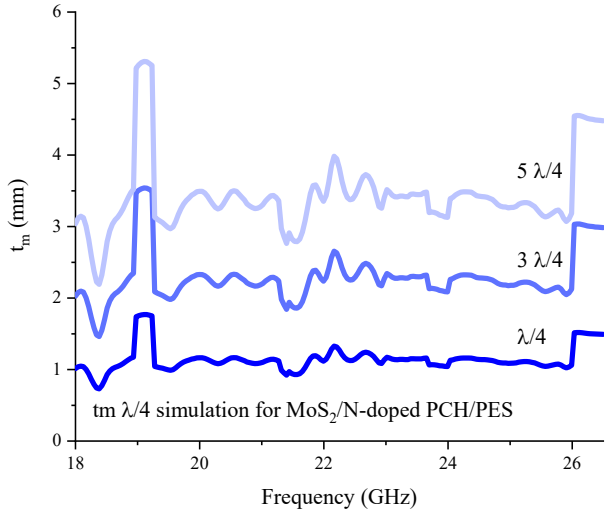
1. 2. Microwave absorbing features

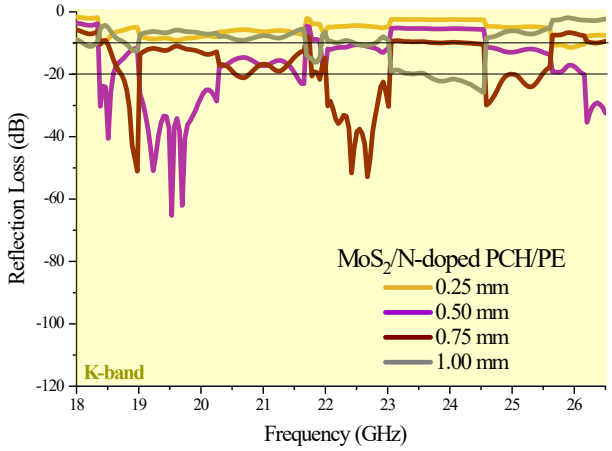



Reflection Loss (dB)
Frequency (GHz)
N-doped PCH/PES
0.25 mm
0.50 mm
0.75 mm
1.00 mm
K-band


Reflection Loss (dB)
Frequency (GHz)
MoS2/N-doped PCH/PES
0.25 mm
0.50 mm
0.75 mm
1.00 mm
K-band


tm (mm)
Frequency (GHz)
5 λ/4
3 λ/4
λ/4
tm λ/4 simulation for N-doped PCH/PES


tm (mm)
Frequency (GHz)
5 λ/4
3 λ/4
λ/4
tm λ/4 simulation for MoS2/N-doped PCH/PES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0.25 mm
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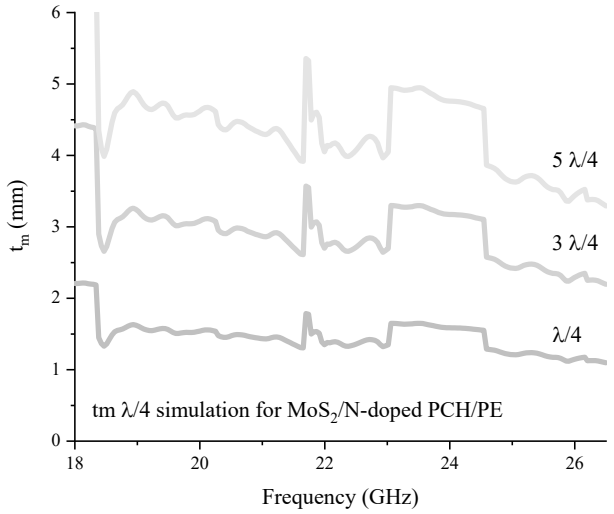

Fig. S1. Microwave absorption and simulation of matching thickness for the composites from 18.0 to 26.5 GHz

Table. S2. Microwave absorbing/shielding and optical equations

Entry/title:	**Equation/s:**
1/Kubelka–Munk theory	$(\alpha h\nu)^2 = h\nu - Eg$, $\alpha = -1/t \ln T$, and $T = 10^{-A}$
2/Transmission line theory	$R(dB) = 20Log\left\|\frac{Z_{in} - Z_0}{Z_{in} + Z_0}\right\|$, $Z_{in} = \sqrt{\frac{\mu_r}{\varepsilon_r}}\tanh\left[j\sqrt{\mu_r\varepsilon_r}f\left(\frac{2\pi}{c}\right)d\right]$, $Z_0 = \sqrt{\frac{\mu_0}{\varepsilon_0}}$, $\varepsilon_r = \varepsilon' - j\varepsilon''$, and $\mu_r = \mu' - j\mu''$
3/Attenuation constant	$\alpha = \sqrt{\sqrt{(\varepsilon_r''\mu_r'' - \varepsilon_r'\mu_r')^2 + (\varepsilon_r'\mu_r'' + \varepsilon_r''\mu_r')^2} + (\varepsilon_r''\mu_r'' - \varepsilon_r'\mu_r')}\frac{\sqrt{2}f\pi}{c}$

4/Impedance matching	$Z = \frac{Z_{in}}{Z_0} = \sqrt{\frac{\mu_r}{\varepsilon_r}}$
5/Debye relaxation theory	$\left(\varepsilon' - \frac{\varepsilon_s + \varepsilon_\infty}{2}\right)^2 + (\varepsilon'')^2 = \left(\frac{\varepsilon_s - \varepsilon_\infty}{2}\right)^2$
6/Quarter wavelength mechanism	$t_m = \frac{nc}{4f_m\sqrt{\lvert\varepsilon_r\rvert\lvert\mu_r\rvert}}$
7/Eddy current loss	$C_0 = \mu''(\mu')^{-2}f^{-1}$
8/Electromagnetic interference SE	$SE_T = SE_A + SE_R$, $SE_T = -10\log\lvert S_{12}\rvert^2$, $SE_A = -10\log\left(\frac{\lvert S_{21}\rvert^2}{1-\lvert S_{11}\rvert^2}\right)$, $SE_R = -10\log(1-\lvert S_{11}\rvert^2)$, and $SE_T\% = 100\left(1-10^{\left(-\frac{SE_T}{10}\right)}\right)$

Table. S3. Definitions of the characters [1-10]

Parameter:	**Definition:**	**Parameter:**	**Definition:**	**Parameter:**	**Definition:**
d	Thickness of absorber	c	Velocity of light in free space	Z_{in}	Input impedance
μ′	Real part of permeability	μ″	Imaginary part of permeability	t_m	Matching thickness
α	Absorption coefficient	T	Transmittance	ν	Frequency

ε'	Real part of permittivity	ε''	Imaginary part of permittivity	f_m	Matching frequency
Z_0	Free space impedance	f	Frequency	n	Odd number
ε_∞	Permittivity at the infinite frequency	ε_s	Static permittivity	ε_0	Permittivity constant
h	Planck constant	t	Thickness	A	Absorbance
μ_0	Permeability constant				

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