Supporting Information

Microwave absorbing characteristics of porphyrin derivates: A loop of conjugated structure

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1. Characterization

1. 1. H-NMR analysis

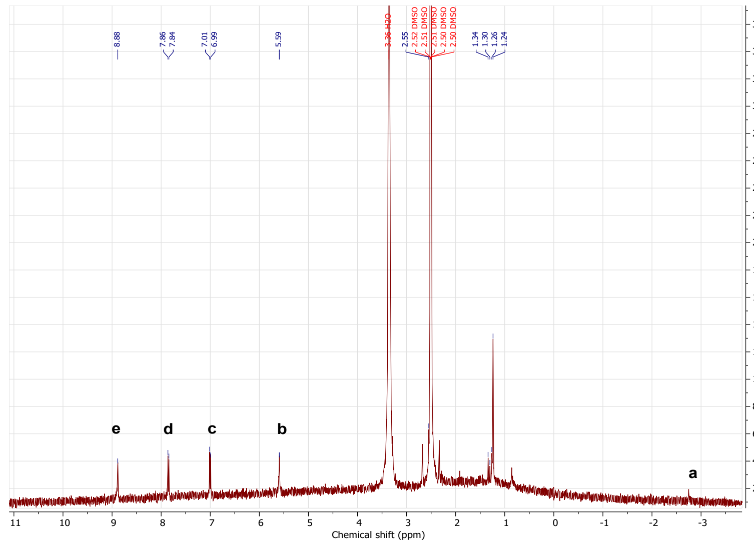
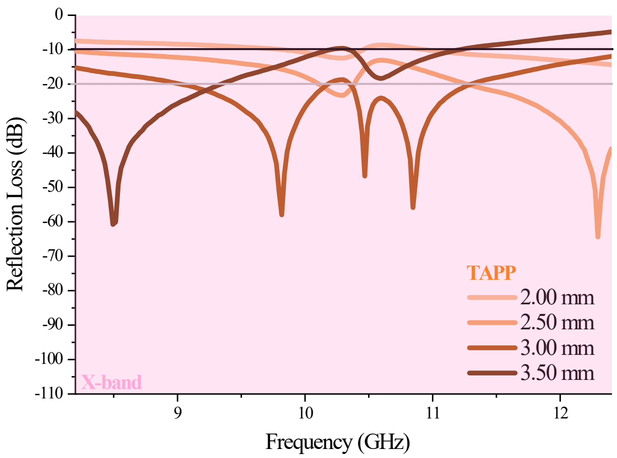
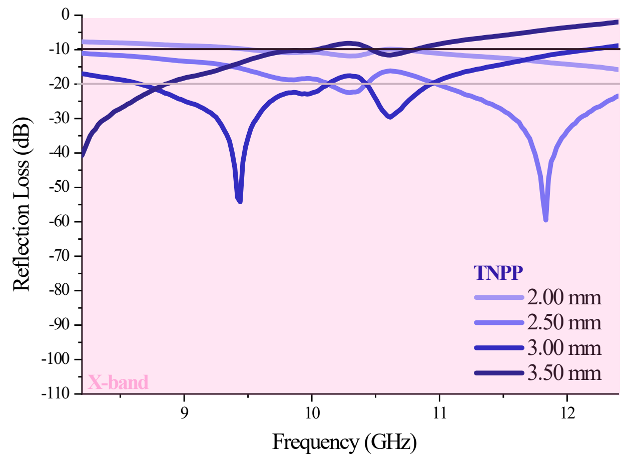
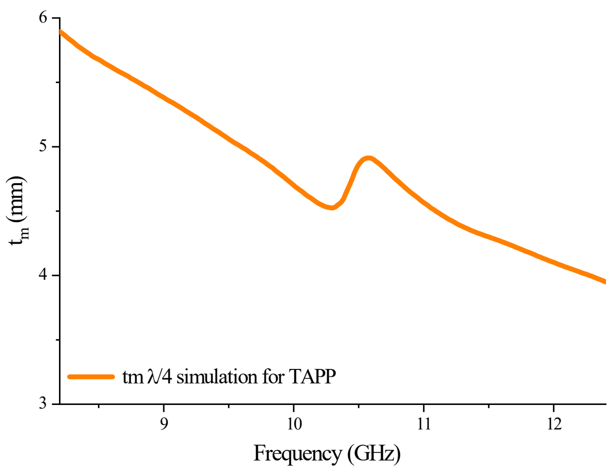


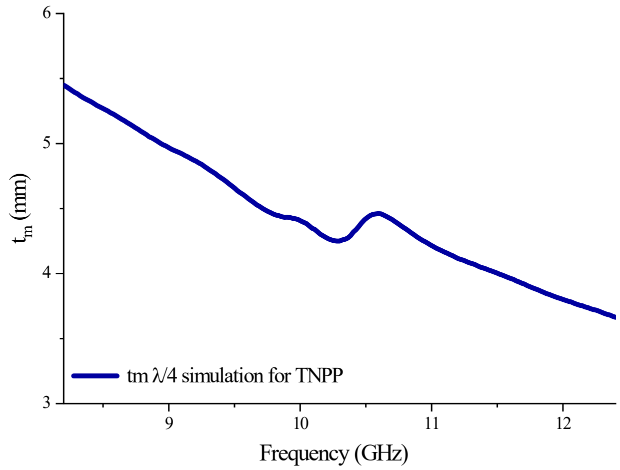
Fig. S1. H-NMR spectrum of TAPP sample

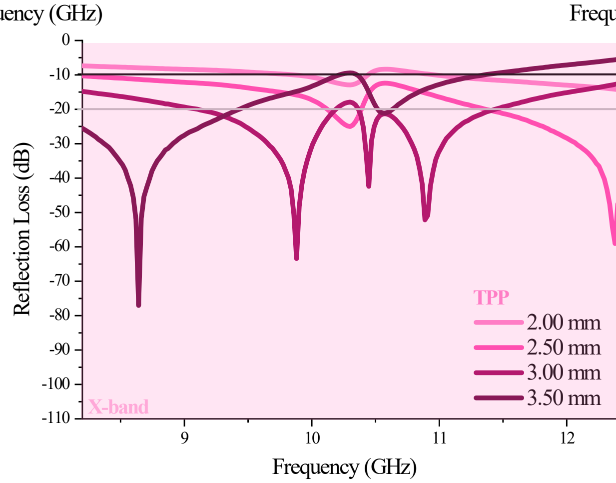
1. 2. Microwave absorbing features


Reflection Loss (dB)
Frequency (GHz)
TAPP
2.00 mm
2.50 mm
3.00 mm
3.50 mm
X-band


Reflection Loss (dB)
Frequency (GHz)
TNPP
2.00 mm
2.50 mm
3.00 mm
3.50 mm
X-band


t_m (mm)
Frequency (GHz)
tm λ/4 simulation for TAPP


t_m (mm)
Frequency (GHz)
tm λ/4 simulation for TNPP


Reflection Loss (dB)
Frequency (GHz)
TPP
2.00 mm
2.50 mm
3.00 mm
3.50 mm
X-band

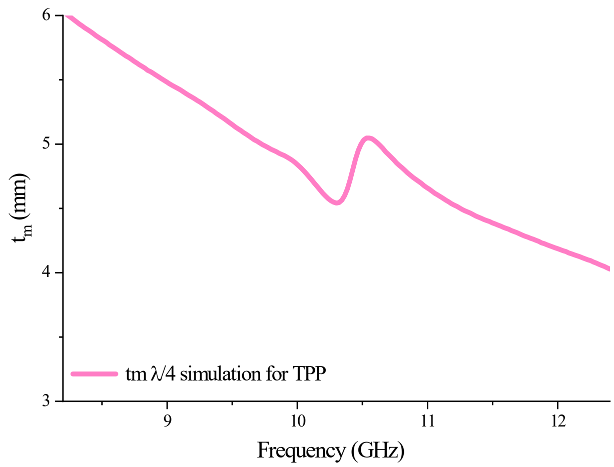


Fig. S2. Microwave absorbing performance and simulation of matching thickness for the porphyrin derivates from 8.2 to 18 GHz

Table. S1. The equations applied to evaluate the results

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/Quarter wavelength mechanism	$t_m = \frac{nc}{4f_m\sqrt{\|\varepsilon_r\|\|\mu_r\|}}$

4/Impedance matching	$Z = \frac{Z_{in}}{Z_0} = \sqrt{\frac{\mu_r}{\varepsilon_r}}$
5/Attenuation constant	$\alpha = \sqrt{\sqrt{(\varepsilon_r''\mu_r'' - \varepsilon_r'\mu_r')^2 + (\varepsilon_r'\mu_r'' + \varepsilon_r''\mu_r')^2} + (\varepsilon_r''\mu_r'' - \varepsilon_r'\mu_r')}\frac{\sqrt{2}f\pi}{c}$
6/Debye relaxation theory	$\left(\varepsilon' - \frac{\varepsilon_s + \varepsilon_\infty}{2}\right)^2 + (\varepsilon'')^2 = \left(\frac{\varepsilon_s - \varepsilon_\infty}{2}\right)^2$

Table. S2. Definitions of the parameters employed to examine the achievements [1-10]

Symbol:	Definition:	Symbol:	Definition:	Symbol:	Definition:
d	Thickness of absorber	Z_{in}	Input impedance	c	Velocity of light in free space
α	Absorption coefficient	ν	Frequency	T	Transmittance
μ′	Real part of permeability	t_m	Matching thickness	μ″	Imaginary part of permeability
h	Planck constant	A	Absorbance	t	Thickness
Z_0	Free space impedance	n	Odd number	f	Frequency
ε′	Real part of	f_m	Matching	ε″	Imaginary part of

	permittivity		frequency		permittivity
ε_∞	Permittivity at the infinite frequency	ε_0	Permittivity constant	ε_s	Static permittivity

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