Supporting Information

Synthesis and electromagnetic wave absorption performance of $NiCo_2O_4$ nanomaterials with different nanostructures

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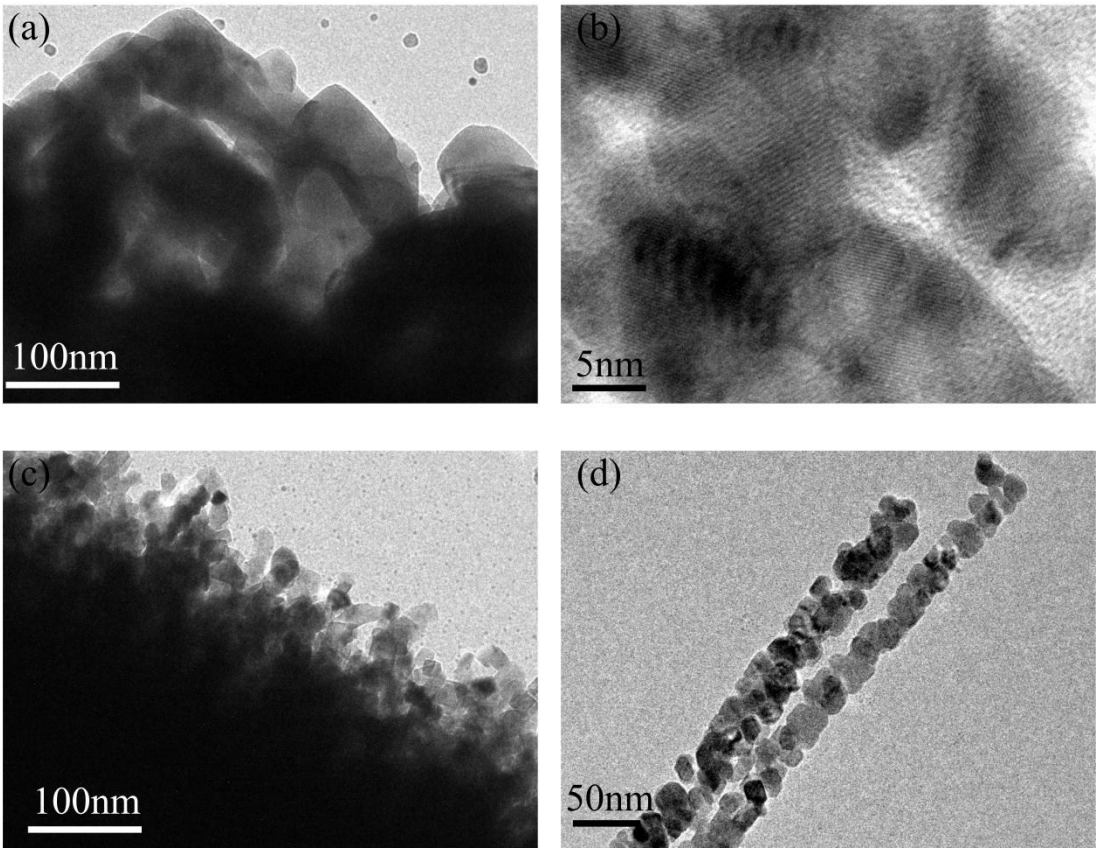

Fig. S1 TEM images of (a, b) bayberry-like $NiCo_2O_4$ and (c, d) needle arrays $NiCo_2O_4$ nanomaterials.

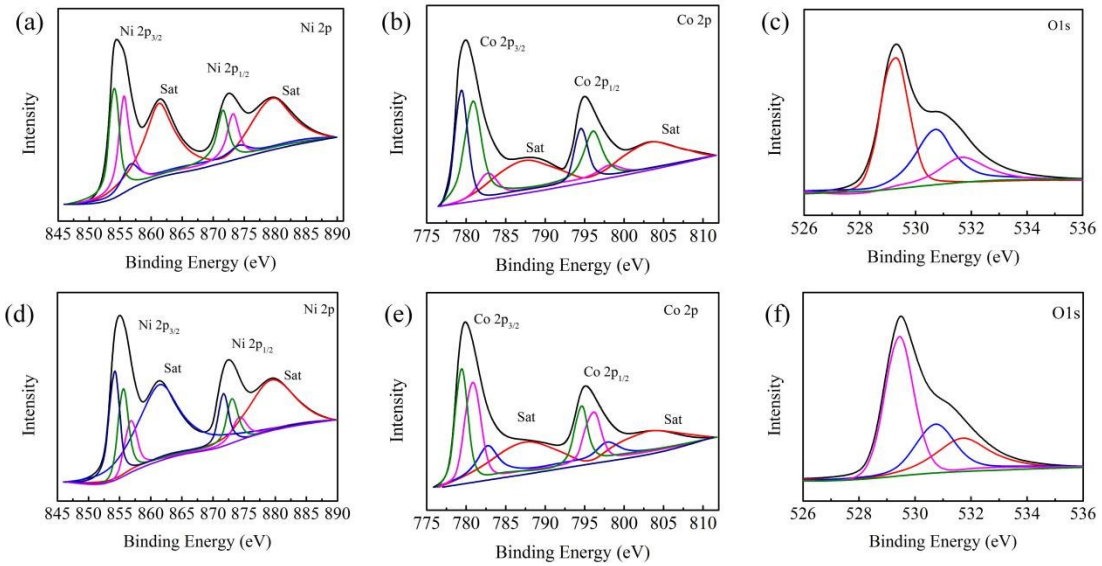

Fig. S2 XPS spectra of (a-c) bayberry-like $NiCo_2O_4$ and (d-f) needle arrays $NiCo_2O_4$ nanomaterials.

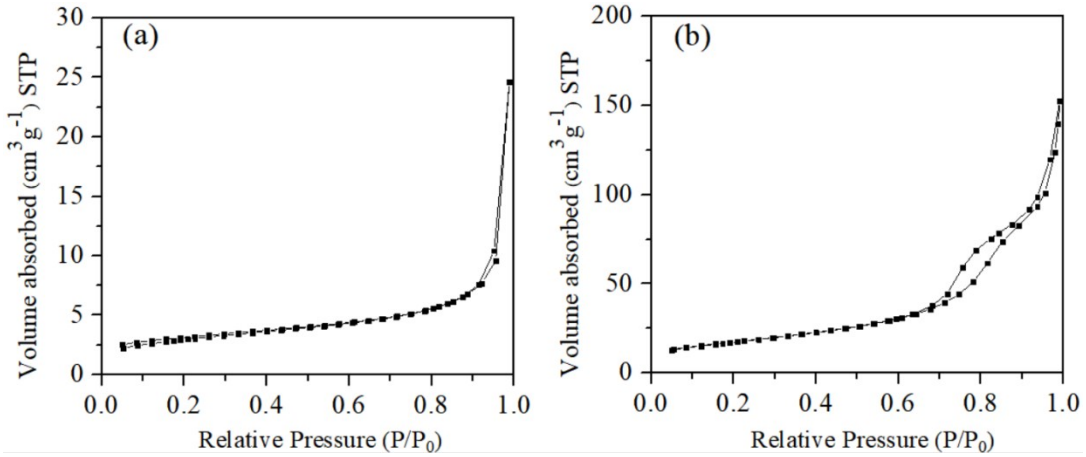

Fig. S3 N_2 adsorption/desorption isotherms of (a) bayberry-like $NiCo_2O_4$ and (b) needle arrays $NiCo_2O_4$ nanomaterial.

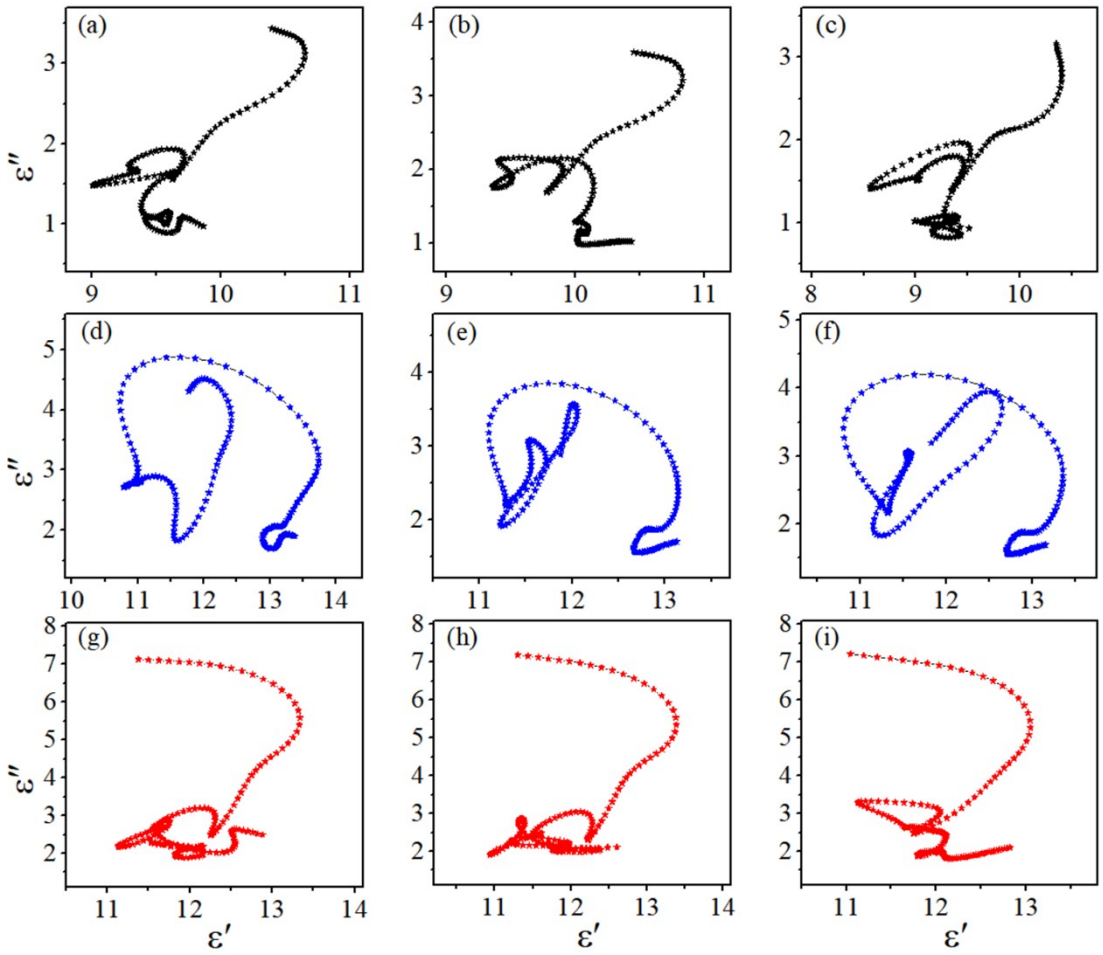

Fig. S4 Plots of $\varepsilon'-\varepsilon''$ relation curves: (a-c) bayberry-, (d-f) nanoneedle arrays and (g-i) urchin-like $NiCo_2O_4$.

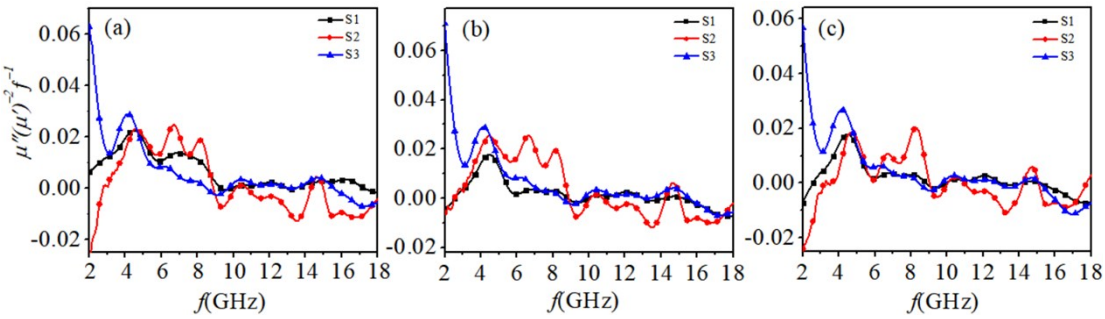

Fig. S5 (a-c) Frequency dependence of $\mu''(\mu')^{-2}f^{-1}$ values for these nanomaterials: (S1) bayberry-, (S2) nanoneedle arrays- and (S3) urchin-like $NiCo_2O_4$.

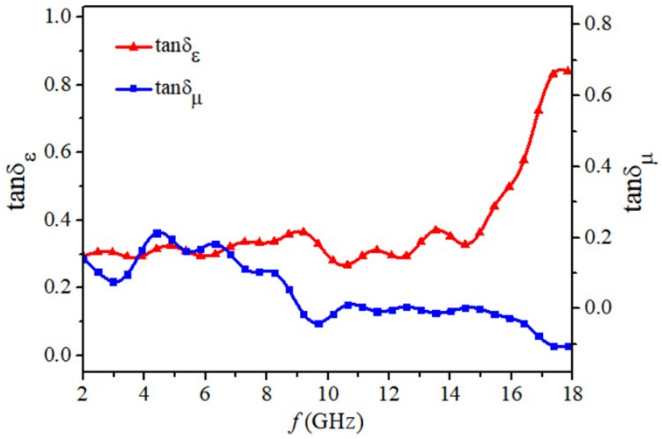

Fig. S6 Frequency dependence of tan δ_ε and tan δ_μ of urchin-like $NiCo_2O_4$ nanomaterials.

samples	bayberry-like $NiCo_2O_4$	needle arrays $NiCo_2O_4$	urchin-like $NiCo_2O_4$
frequency range (GHz)	14.64-18.00	14.96-18.00	12.48-18.00
maximum ε'' value	4.04	4.20	8.38
average ε'' value	3.24	3.54	5.80
number of cole-cole semicircle	7	6	7
maximum tan δ_ε value	0.37	0.39	0.84
average tan δ_ε value	0.25	0.26	0.38

maximum attenuation constant (α)	172.17	236.19	360.82

Table S1 The parameters related to polarization relaxation capability of these $NiCo_2O_4$ nanomaterials.

samples	bayberry-like $NiCo_2O_4$	needle arrays $NiCo_2O_4$	urchin-like $NiCo_2O_4$
grain sizes(nm)	14.9	12.4	9.4
pore sizes(nm)	14.33	21.03	12.17
specific surface areas(m^2/g)	10.62	40.06	62.89
minimum RL(dB)	-39	-45	-40
thickness(mm)	2.5	4.0	1.4
absorption bandwidth(GHz)	3.1	3.5	4.0

Table S2 Comparison of characteristic parameters of these $NiCo_2O_4$ nanomaterials.