Supporting Information

Morphology-controlled synthesis and excellent microwave absorption performance of $ZnCo_2O_4$ nanostructures via a self-assembly process of flake units

*Xiao Li, Lei Wang, Wenbin You, Linshen Xing, Xuefeng Yu, Yuesheng Li, and Renchao Che**

1. Synthesis of ball-like $ZnCo_2O_4$

Briefly, $ZnCl_2$ (1 mmol) and $CoCl_2 \cdot 6H_2O$ (2 mmol) were dissolved in a mixed solvent (50 ml EG and 5 ml deionized water) under magnetic stirring at room temperature. Then, 30 mmol of NH_4HCO_3 were added into the mixture. After being stirred for 30 min, the resultant solution was transferred into a Teflon lined stainless-steel autoclave with a capacity of 100 mL, and heated at 200℃ for 24 h in an oven. The ball-like $ZnCo_2O_4$ precursors were collected by centrifuging, washed with water three times and ethanol four times, and finally dried in a vacuum oven at 60℃ for 8 h. Finally, the black ball-like $ZnCo_2O_4$ materials were obtained after calcination at 600℃ for 4 h in air. The sample was ready for further characterization.

2. Synthesis of hydrangea-like $ZnCo_2O_4$

Briefly, $Zn(CH_3COO)_2 \cdot 2H_2O$ (1 mmol) and $Co(CH_3COO)_2 \cdot 4H_2O$ (2 mmol)were dissolved in 40 ml EG under magnetic stirring at room temperature. After being stirred for 30 min, the resultant solution was transferred into a Teflon lined stainless-steel autoclave with a capacity of 50 mL, and heated at 180℃ for 12 h in an oven. The hydrangea-like $ZnCo_2O_4$ precursors were collected by centrifuging, washed with water three times and ethanol four times, and finally dried in a vacuum oven at 60℃ for 12 h. Finally, the black cabbage-like $ZnCo_2O_4$ materials were obtained after calcination at 400℃ for 2 h in air. The sample was ready for further characterization.

3. Synthesis of pineapple-like $ZnCo_2O_4$

Briefly, $ZnCl_2$ (1 mmol) and $CoCl_2{\cdot}6H_2O$ (2 mmol) were dissolved in a mixed solvent (50 ml EG and 5 ml distilled water) under magnetic stirring. Then, 30 mmol of NH_4HCO_3 and 10 mmol of urea were added to the above solution. After being stirred for 30 min, the resultant solution was transferred into a Teflon lined stainless-steel autoclave with a capacity of 100 mL, and heated at 200℃ for 24 h in an oven. The pineapple-like $ZnCo_2O_4$ precursors were collected by centrifuging, washed with water three times and ethanol four times, and finally dried in a vacuum oven at 60℃ for 8 h. Finally, the black pineapple-like $ZnCo_2O_4$ materials were obtained after calcination at 600℃ for 4 h in air. The sample was ready for further characterization.

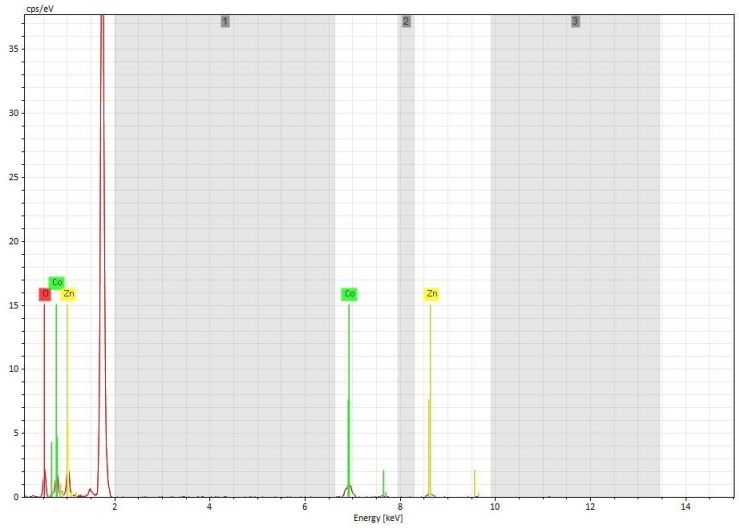

Figure S1. The EDS of cabbage-like $ZnCo_2O_4$ samples.

EDS quantitative analysis shows that the atomic ration of Zn, Co and O is 1:1.96:3.68, implying a certain degree of oxygen vacancy in cabbage-like $ZnCo_2O_4$ spinel crystal.

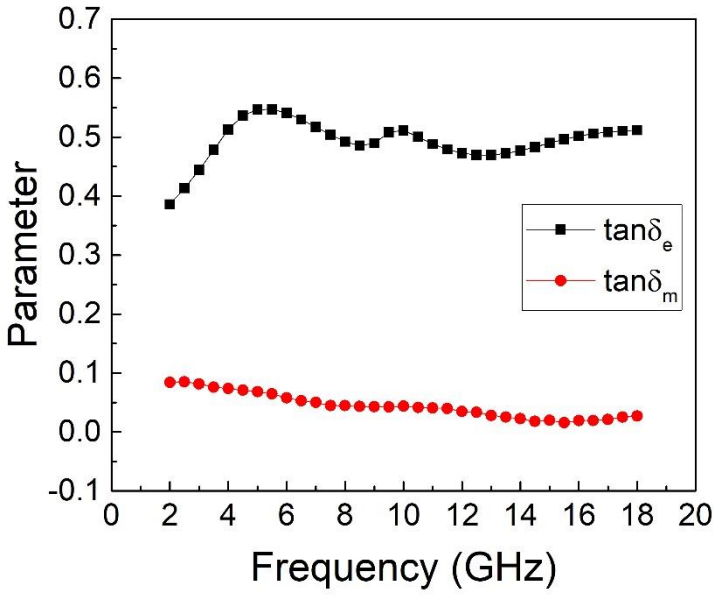

Figure S2. The tan δ_e and tan δ_m of as-prepared $ZnCo_2O_4$ samples.

Because of the calculated tan δ_e values are much higher than that of tan δ_m, as-prepared $ZnCo_2O_4$ samples can be considered as a dielectric loss-type microwave absorber.