Supporting Information

Morphology-controlled synthesis and excellent microwave absorption performance of ZnCo2O4 nanostructures via a self-assembly process of flake units

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1. **Synthesis of ball-like ZnCo$_2$O$_4$**

   Briefly, ZnCl$_2$ (1 mmol) and CoCl$_2$·6H$_2$O (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$_4$HCO$_3$ 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°C for 24 h in an oven. The ball-like ZnCo$_2$O$_4$ precursors were collected by centrifuging, washed with water three times and ethanol four times, and finally dried in a vacuum oven at 60°C for 8 h. Finally, the black ball-like ZnCo$_2$O$_4$ materials were obtained after calcination at 600°C for 4 h in air. The sample was ready for further characterization.

2. **Synthesis of hydrangea-like ZnCo$_2$O$_4$**

   Briefly, Zn(CH$_3$COO)$_2$·2H$_2$O (1 mmol) and Co(CH$_3$COO)$_2$·4H$_2$O (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°C for 12 h in an oven. The hydrangea-like ZnCo$_2$O$_4$ precursors were collected by centrifuging, washed with water three times and ethanol four times, and finally dried in a vacuum oven at 60°C for 12 h. Finally, the black cabbage-like ZnCo$_2$O$_4$ materials were obtained after calcination at 400°C for 2 h in air. The sample was ready for further characterization.

3. **Synthesis of pineapple-like ZnCo$_2$O$_4$**
Briefly, ZnCl$_2$ (1 mmol) and CoCl$_2$·6H$_2$O (2 mmol) were dissolved in a mixed solvent (50 ml EG and 5 ml distilled water) under magnetic stirring. Then, 30 mmol of NH$_4$HCO$_3$ 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°C for 24 h in an oven. The pineapple-like ZnCo$_2$O$_4$ precursors were collected by centrifuging, washed with water three times and ethanol four times, and finally dried in a vacuum oven at 60°C for 8 h. Finally, the black pineapple-like ZnCo$_2$O$_4$ materials were obtained after calcination at 600°C for 4 h in air. The sample was ready for further characterization.

**Figure S1.** The EDS of cabbage-like ZnCo$_2$O$_4$ 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$_2$O$_4$ spinel crystal.
Figure S2. The tan $\delta_e$ and tan $\delta_m$ of as-prepared ZnCo$_2$O$_4$ samples.

Because of the calculated tan $\delta_e$ values are much higher than that of tan $\delta_m$, as-prepared ZnCo$_2$O$_4$ samples can be considered as a dielectric loss-type microwave absorber.