Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supplementary Information

Dual-ligands mediated One-pot Self-Assembly of Cu/ZnO Core/Shell Structures for Enhanced Microwave absorption

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This file contains:

Supplementary SEM and TEM images, high resolution XPS, the detail detection procedure for microwave absorption and Cole−Cole plots.

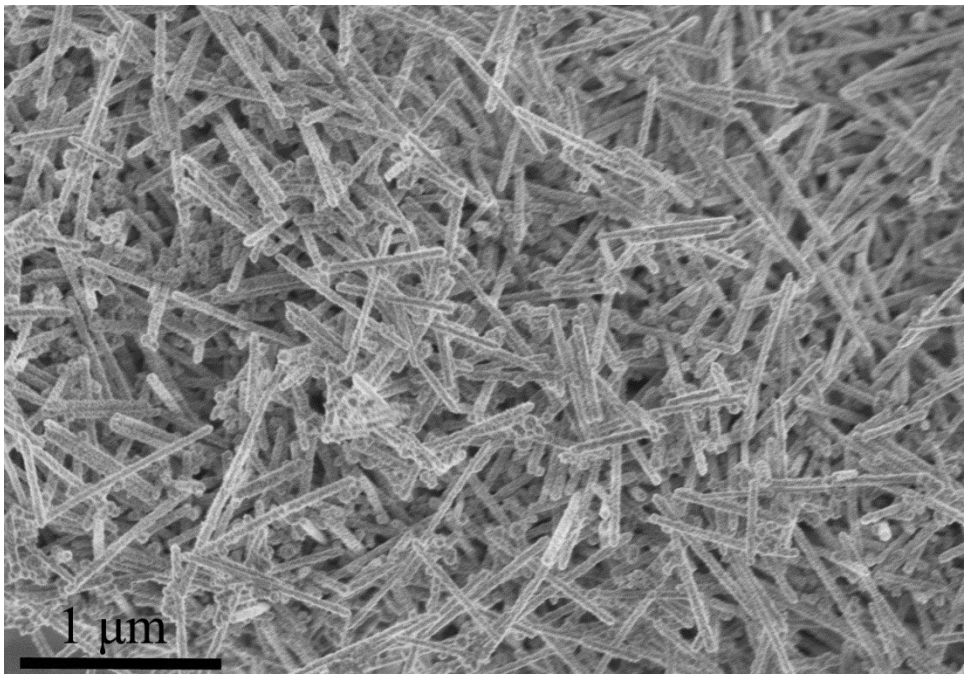

Figure S1 Typical low magnification SEM image of sample **2**.

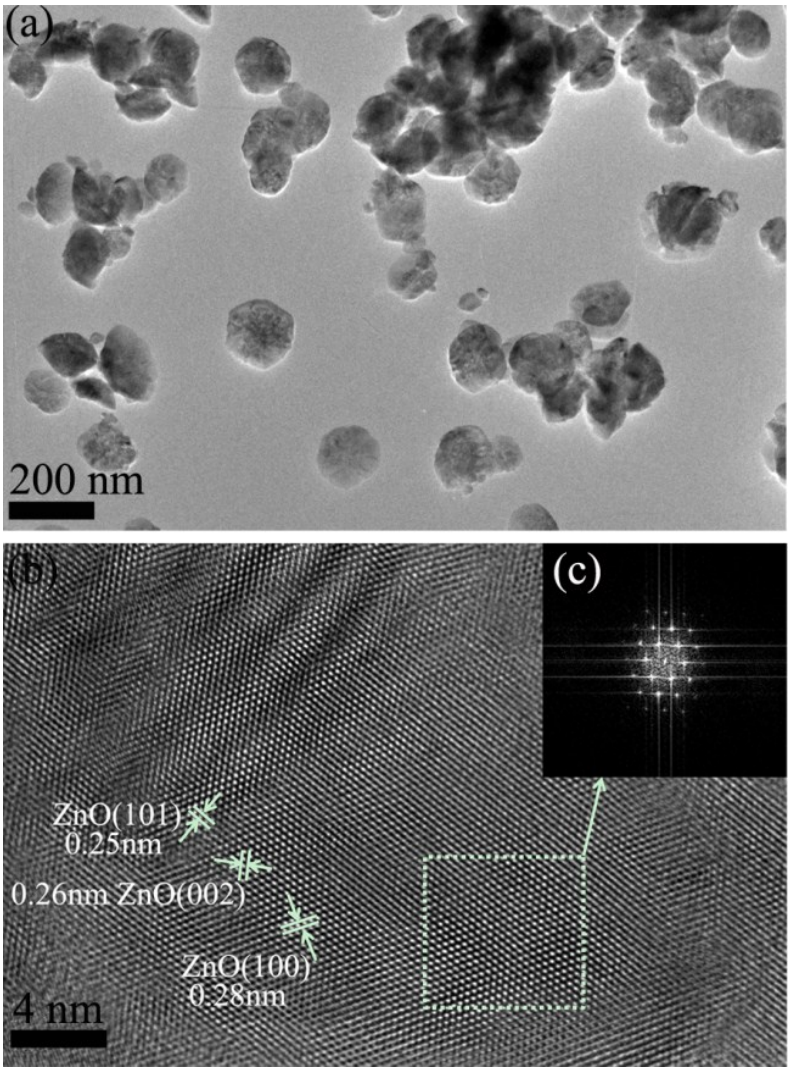

Figure S2 (a) Typical TEM image of p-ZnO nanoplates. (b) HRTEM image showing the polycrystalline nature of the p-ZnO with an FFT pattern inset of the dotted square domain.

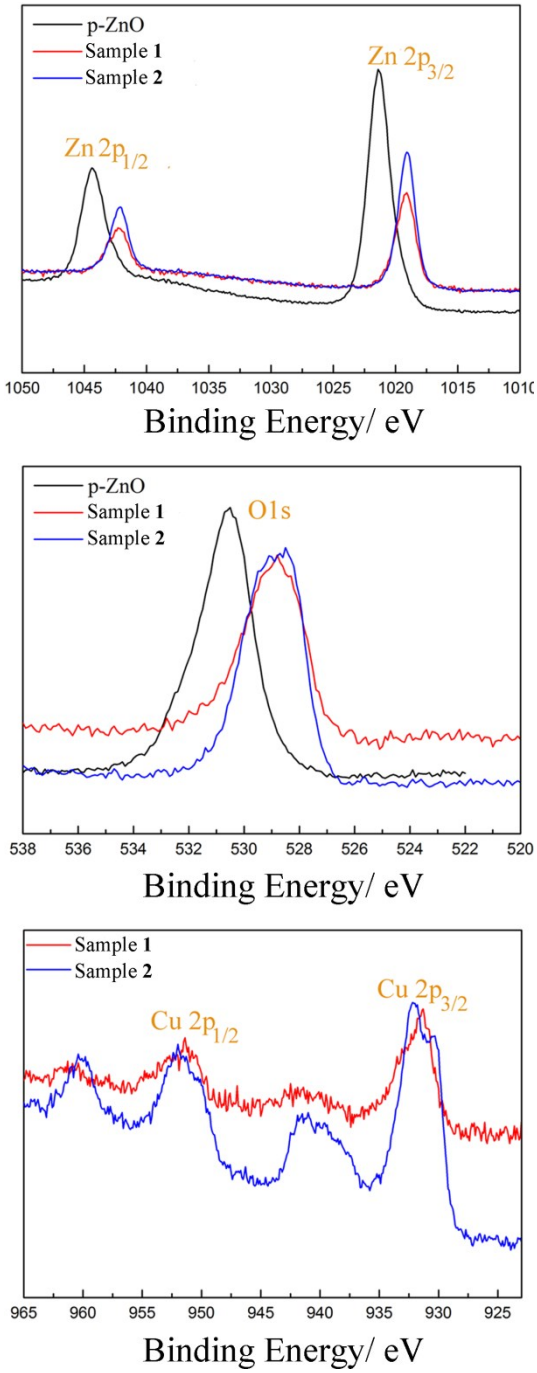

Figure S3 High resolution XPS spectra of as-synthetic samples: (a) Zn 2p region; (b) O1s region and (c) Cu 2p region.

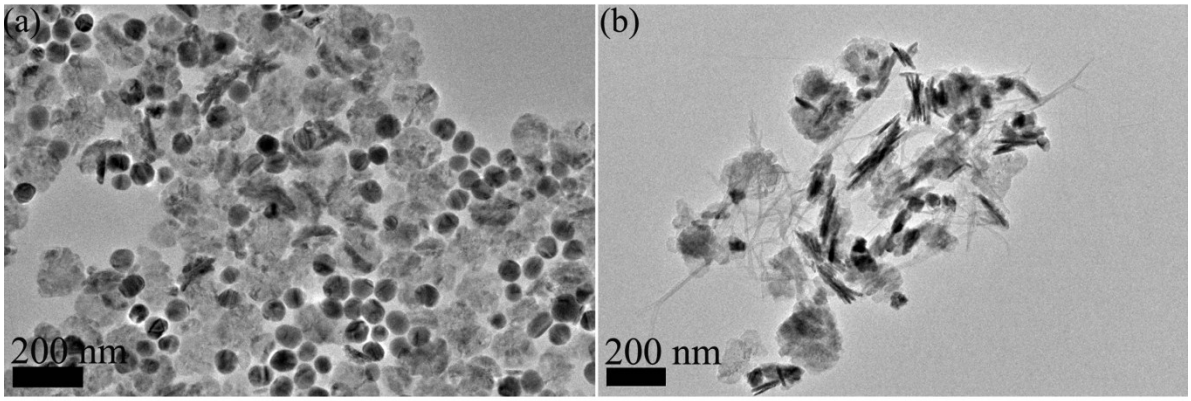

Figure S4. TEM images of the comparison experiments without the 1, 2-dodecanediol. (a) the products were obtianed from the preparation process which is identical with the sample **1**. (b) the products were syntheticed through the same process as the preparation of sample **2**.

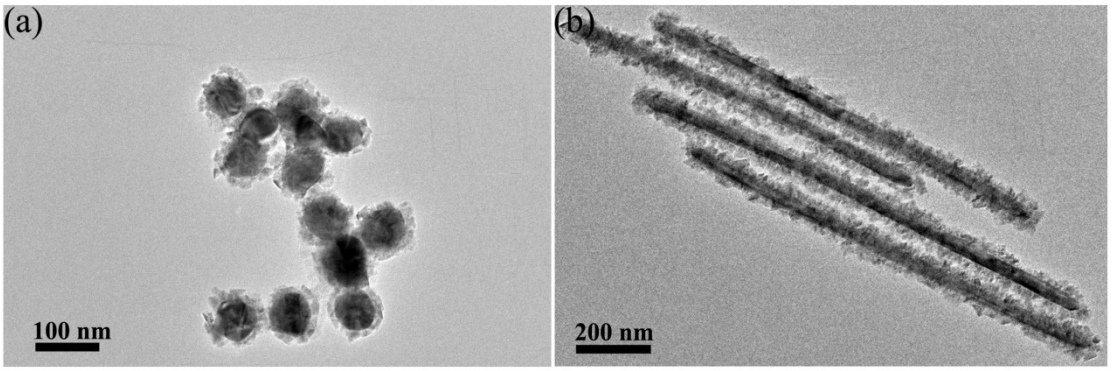

Figure S5. TEM images of the control experiments that the 1, 2-dodecanediol was replaced by ethylene glycol: (a) heating-up with a temperature ramp of 10°C/min and (b) heating-up with a ramp of 2 °C/min.

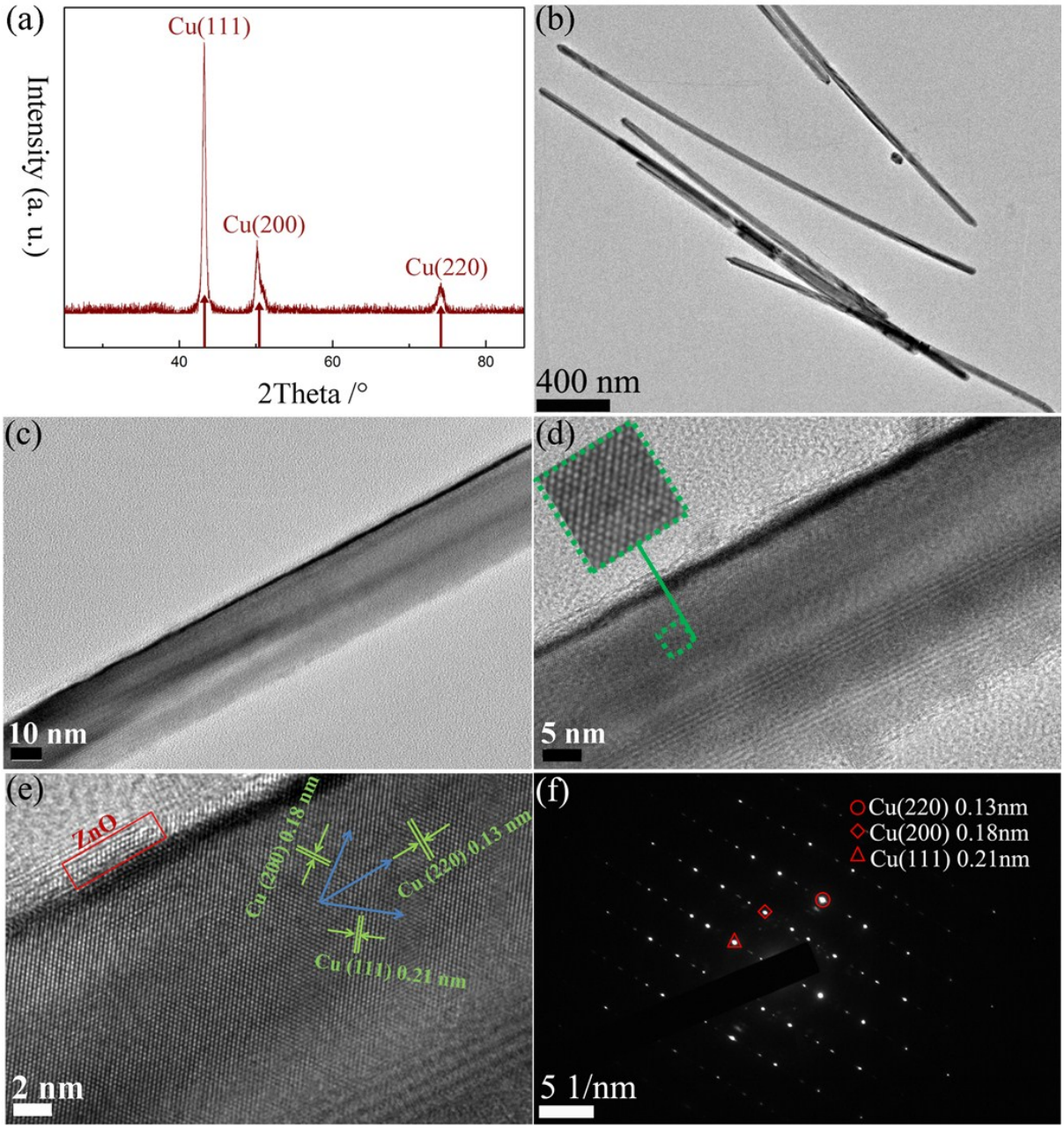

Figure S6 (a) XRD pattern of the Cu nanowires. (b) Typical TEM image of the Cu nanowires. (c) HRTEM image showing the crystalline nature of the Cu nanowires. (d) The typical SAED patterns of the Cu nanowires.

The detailed preparation process of Cu nanowires as follows. 0.08 mmol zinc acetate dihydrate mixed with 0.10 mmol copper(II) chloride dihydrate, 0.80 mmol 1, 2-dodecanediol and 4.5 g octadecylamine were loaded in a 25 ml three necked flask and heated under continuous stirring to 80 °C until the octadecylamine dissolved

thoroughly and the reaction mixture colour turned to blue. Then the temperature of the reaction system was increased to 160 °C and maintained for one hour, and the solution turned bright yellow. Then the temperature was raised to 250 °C with a temperature ramp of 2 °C/min. After 2 minutes at 250 °C (Timing recorded once the temperature was reached at 250 °C), removing the heating mantle, and injecting 10ml cold isopropanol into the resultant mixture before the octadecylamine coagulating. The syntheses process was carried out with a protective atmosphere of N_2.

The Detail Procedure for Detection of Microwave Absorption:

Microwave absorption properties were examined by dispersing the as-synthesized three samples into epoxy resin with a weight ratio of 1:5, respectively. A portion of the composite was coated on an aluminum substrate (180 mm × 180 mm) with a thickness of several millimeters (2−5 mm) to measure the reflection loss of the samples. The remained sample was molded into the hollow pipe of a rectangular waveguide cavity with dimensions of 10.2 mm × 2.9 mm × 1.2 mm for complex permittivity and permeability measurements at 8-18 GHz and molded into a coaxial waveguide with a size of 3 mm (inside) × 7 mm (outside) × 3 mm (height) for measurements at 2-8 GHz to ensure the data consistency. The complex relative permittivity and reflection loss were measured with a HP8510C vector network analyzer in the 2-18 GHz range. According to the transmission line theory, the reflection loss (RL) values of different composites at a given frequency and thickness layer can be defined with the following equations (**1**) and (**2**). Where ε_r and μ_r are the relative complex permittivity and permeability of the absorber medium, c is the velocity of light, f is the frequency of microwave in free space, d is the coating thickness, and Z_{in} is the input impedance of the absorber.

$$\mathrm{RL(dB)} = 20\log_{10}\left|\frac{Z_{in} - 1}{Z_{in} + 1}\right| \qquad (1)$$

$$Z_{in} = \sqrt{\left(\frac{\mu_r}{\varepsilon_r}\right)}\tanh\left[j\left(\frac{2\pi fd}{c}\right)\sqrt{(\mu_r\varepsilon_r)}\right] \qquad (2)$$

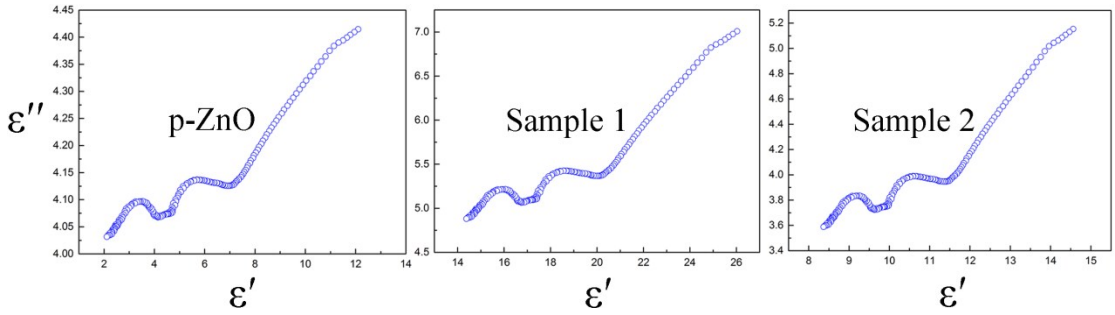

Figure S7 Cole−Cole plots of (a) p-ZnO, (b) Sample **1** and (c) sample **2**.

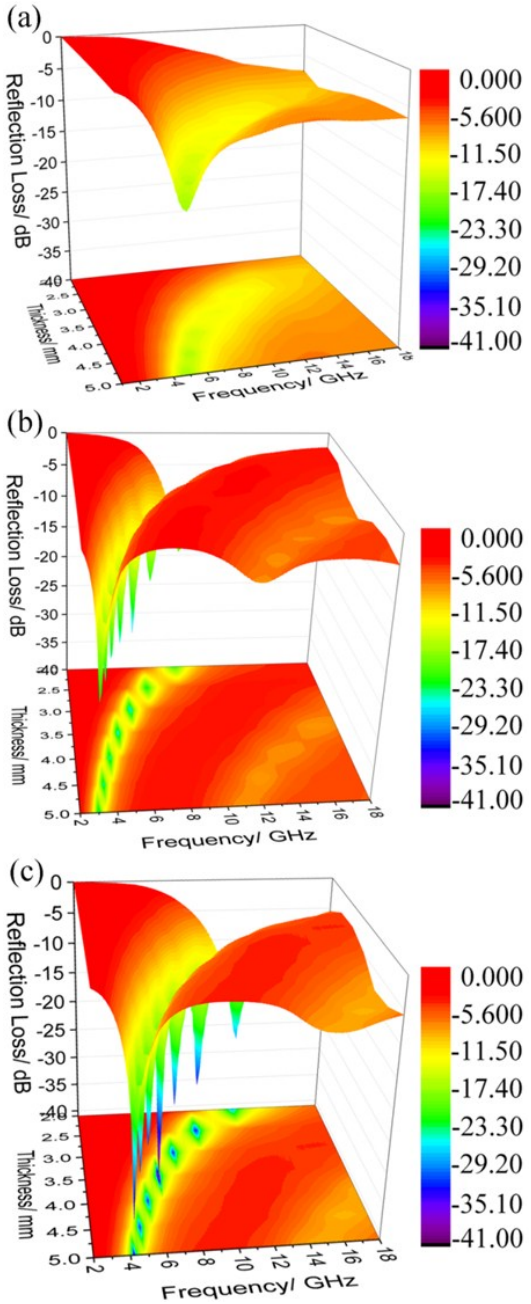

Figure S8 The three-dimensional reflection loss profiles for (a) p-ZnO, (b) sample **1** and (c) sample **2**, respectively.