Fabrication of hierarchical TiO$_2$ coating Co$_{20}$Ni$_{80}$ particle with tunable core size as high-performance wide-band microwave absorber

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**Fig. S-1** Electronic microscopy Images of the CoNi alloy microspheres, (a) 100 nm, (b) 500 nm, (c) 1 μm and the size distribution chart.

**Fig. S-2** (a) SEM image of the CoNi@TiO$_2$ with 100 nm CoNi core, 100 nm TiO$_2$ shell, (b) The enlarged SEM image of the CoNi@TiO$_2$ with 500 nm CoNi core, 100 nm TiO$_2$ shell, (c) A single broken CoNi@TiO$_2$ with 1 μm CoNi core, 100 nm TiO$_2$ shell.
Fig. S-3 TEM image the CoNi@TiO$_2$ particle with a 500nm CoNi core and a 100nm TiO$_2$ shell

Fig. S-4 The electronic holography of the CoNi@TiO$_2$ particle with a 500nm CoNi core and a 100nm TiO$_2$ shell