**Supplementary Information**

**Constructing BaTiO3/TiO2@polypyrrole composites with hollow multishelled structure for enhanced electromagnetic wave absorbing properties**

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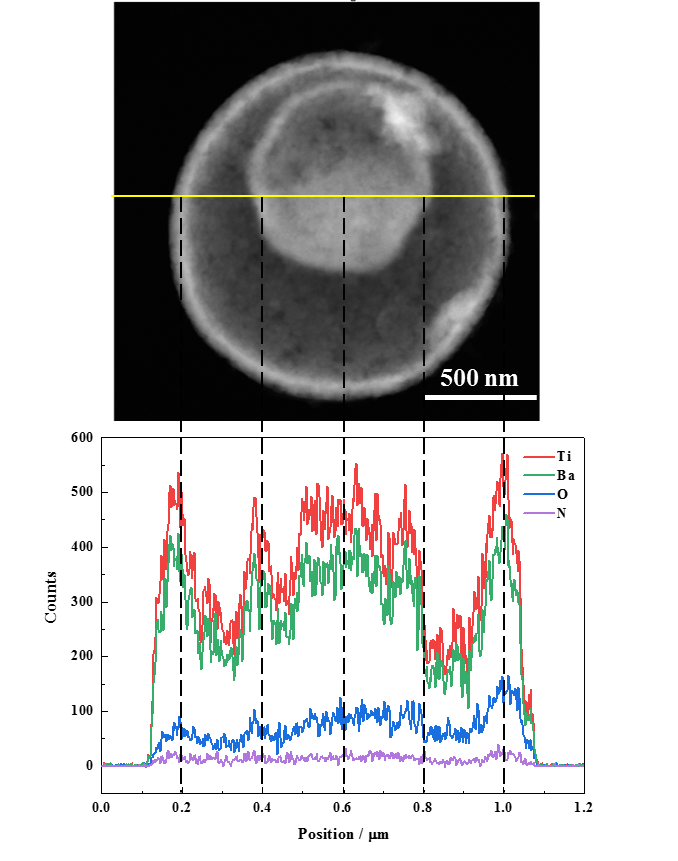
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**Fig. S1. XRD patterns of 1s-, 2s-, and 3s-TiO2 HoMSs.**

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**Fig. S2. TEM image of a slice of 3s-BaTiO3/TiO2@PPy in dark field, and Ba, Ti, O, and N ratios in different shells by EDS line scanning**



**Fig. S3. The real (ε′) and imaginary (ε″) of complex permittivity (a, b), and tan δe (c) versus frequency of BaTiO3/TiO2 HoMSs; the real (μ′) and imaginary (μ″) of permeability (d, e), and tan δμversus frequency (f) of BaTiO3/TiO2 HoMSs.**





**Fig. S4. Cole-cole plots of 1s-BaTiO3/TiO2@PPy HoMSs(a), 2s-BaTiO3/TiO2@PPy HoMSs(b) and 3s-BaTiO3/TiO2@PPy HoMSs(c).**

**Fig. S5. RL curves and statistical diagram of absorption bandwidth<-5dB in the thickness range of 1-5mm of 1s-BaTiO3/TiO2 HoMSs (a), 2s-BaTiO3/TiO2 HoMSs (b) and 3s-BaTiO3/TiO2 HoMSs (c).**

**Fig. S6. Attenuation constant α curves of BaTiO3/TiO2 HoMSs (a), impedance matching ratio curves of BaTiO3/TiO2 HoMSs at a thickness of 1.3mm (b).**

**Table S1. Statistics table of absorbing performance of BaTiO3-based composite materials**

|  |  |  |  |
| --- | --- | --- | --- |
| absorbers | minimum RL values, thickness | bandwidth < −10 dB, thickness | References |
| Fe3O4/BaTiO3 | -24dB, 2.33mm | ~0.8GHz, 2.33mm | 42 |
| Ni@BaTiO3 | -42.3dB, 1.88mm | ~2.5GHz, 2mm | 43 |
| BaTiO3 NTs/RGO | -44.9dB, 3mm | 5.4GHz, 2.5mm | 44 |
| BaTiO3@C | -88.5dB, 3mm | 3GHz, 2mm | 10 |
| BaTiO3@MWCNTs | -45dB, 3.5mm | ~4GHz, 1.5mm | 45 |
| BaTiO3/NiFe2O4/RGO | -51.1dB, 2.9mm | 3.12GHz, 2.9mm | 46 |
| Fe3O4-BaTiO3 | -47.4dB, 2.2mm | 5.0GHz, 2mm | 47 |
| Fe3O4@BaTiO3/RGO | -38.2dB, 4mm | 3.5GHz, 1.5mm | 48 |
| CNTs/BaTiO3/PANI | -30.9dB, 4mm | 2.7GHz, 4mm | 49 |
| 1s-BaTiO3/TiO2 | -9.27dB, 5mm | 0 | This work |
| 2s-BaTiO3/TiO2 | -18.53dB, 5mm | 0.91GHz, 5mm | This work |
| 3s-BaTiO3/TiO2 | -9.84dB, 2mm | 0 | This work |
| 1s-BaTiO3/TiO2@PPy | -13.41dB, 1.3mm | 3.47GHz, 1.3mm | This work |
| 2s-BaTiO3/TiO2@PPy | -21.7dB, 1.3mm | 3.77GHz, 1.5mm | This work |
| 3s-BaTiO3/TiO2@PPy | -21.8dB, 1.5mm | 4.20GHz, 1.3mm | This work |