Supporting Information

Indium Tin Oxide as a Dual-band Compatible Stealth Material with Low Infrared Emissivity and Strong Microwave Absorption

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Apparatus

The morphologies of the particles were analyzed by field emission scanning electron microscopy (FESEM, Verios G4 UC), transmission electron microscopy (TEM, Talos F200X G2), selected area electron diffraction (SAED) and energy dispersive spectroscopy (EDS). The phase and crystal structure were characterized by X-ray diffraction (X-ray diffraction, Smart Lab II, Cu Kα radiation instrument) and X-ray photoelectron spectroscopy (XPS, AXIS SUPRA, Al Kα light source). The surface area of the samples was determined by N_2 adsorption-desorption isotherms (TriStar II 20). The resistance of the sample was measured with a digital micro-ohmmeter. The emissivity of the samples was tested with a FT-IR (Nicolet is50), a blackbody radiation source and a heating stage (HCS601G-IRM). The relative permeability and permittivity values of the hybrid were obtained by measuring the S11 and S21 parameters between 2~18 GHz with a vector network analyzer (Agilent N5230A) by using the transmission/reflection coaxial line method.

Infrared emissivity tests

Pure ITO was pressed into solid round pieces with a thickness of about 2 mm. The emissivity characteristics of the material are analyzed according to the test results, and the infrared stealth mechanism of the material is further elaborated.

Microwave absorption performance tests

ITO (50 wt.%) was mixed with paraffin wax and pressed into a coaxial ring with an outer diameter of 7.00 mm, an inner diameter of 3.04 mm, and a thickness of about 2 mm. According to the EM parameters, the absorption characteristics of the material were inferred and analyzed, and the absorption mechanism of the material was further elaborated.

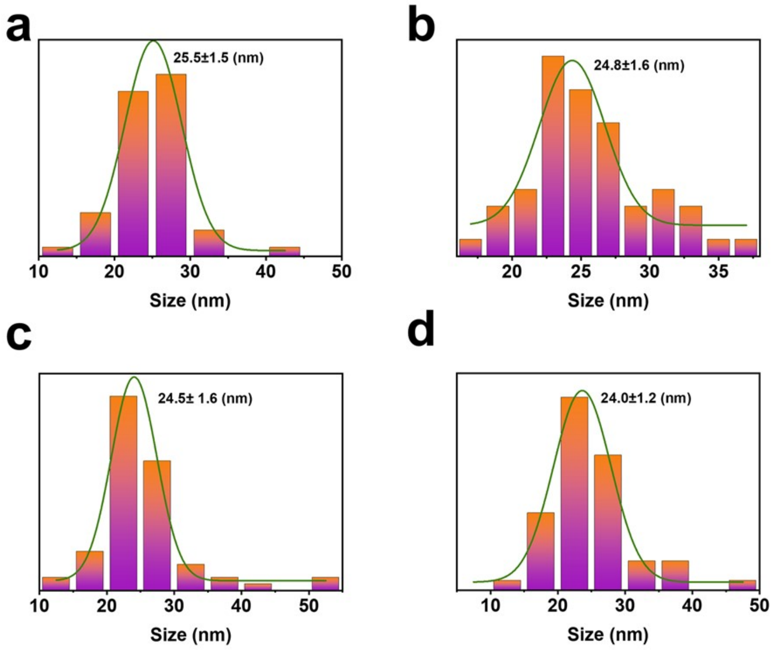

Fig. S1. Particle size distribution of (a) ITO-5, (b) ITO-10, (c) ITO-15, and (d) ITO-20, respectively.

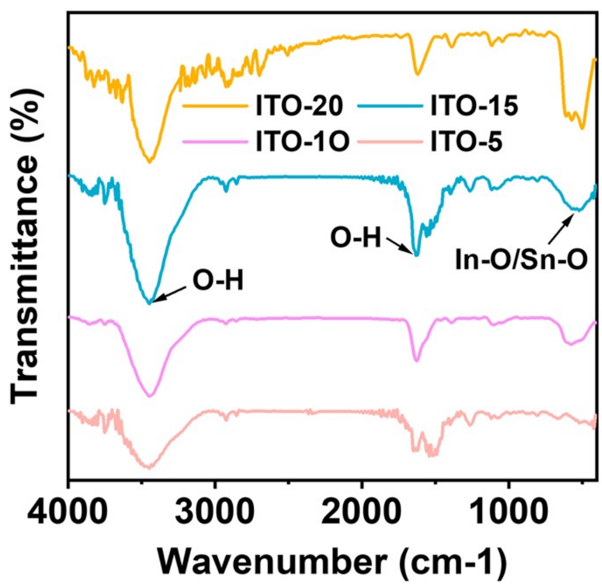

Fig. S2. FT-IR spectra of ITO samples.

As shown in the FT-IR spectra (Fig. S2), the adsorption bands at 3450 cm^{-1} and 1627 cm^{-1} are in O-H stretching mode, which proves the existence of water molecules. Meanwhile, the Sn-O and In-O vibrations are also successfully observed at 570 cm^{-1} and 499 cm^{-1}.

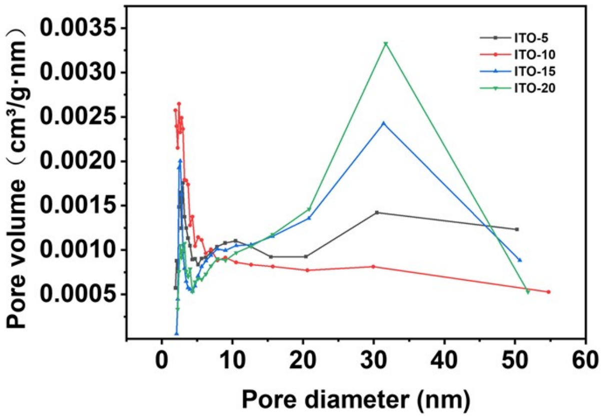

Fig. S3. Pore size distribution.

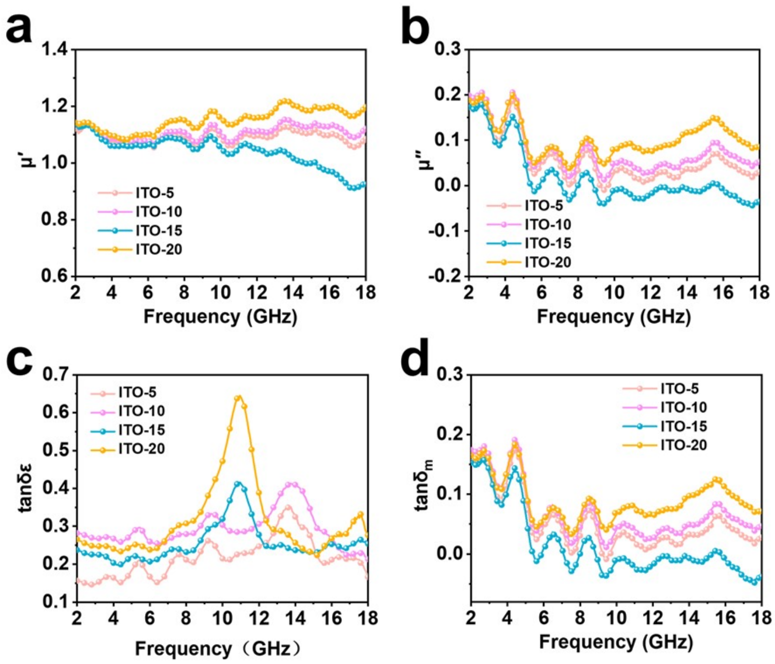

Fig. S4. (a) Magnetic permeability real part for ITO samples, (b) magnetic conduction imaginary part for ITO samples, (c) Tanδ_e for samples, and (d) tanδ_m for ITO samples.

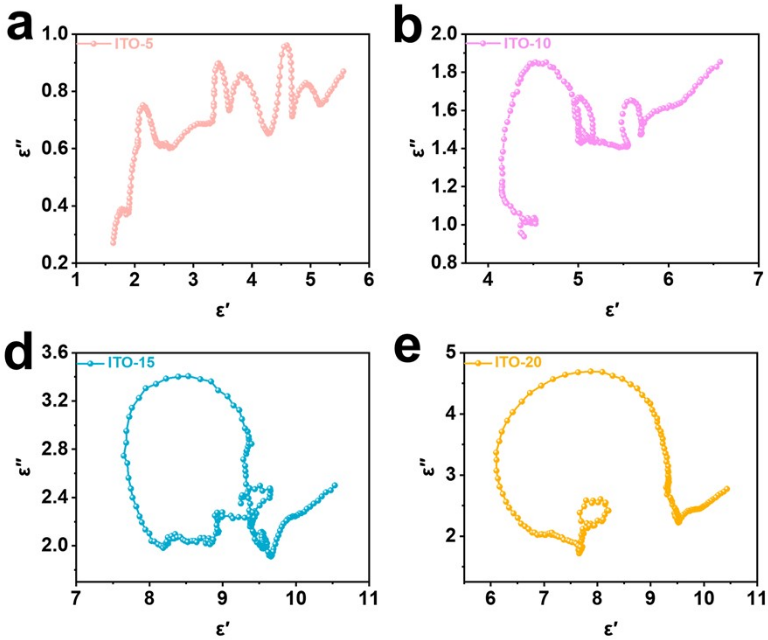

Fig. S5. The original Cole-Cole plots of (a) ITO-5, (b) ITO-10, (c) ITO-15, and (d) ITO-20, respectively.

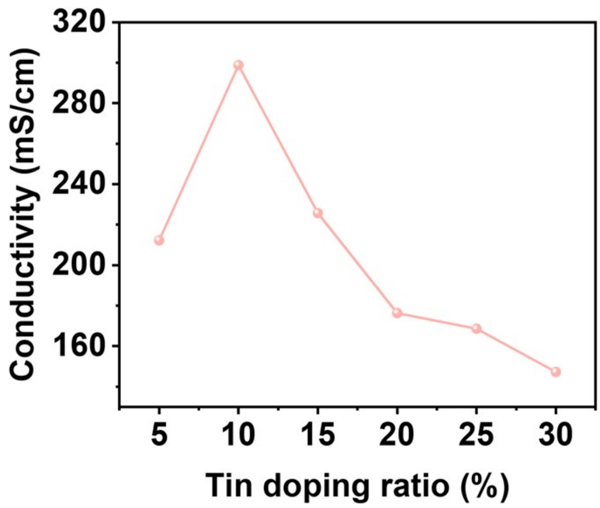

Fig. S6. Conductivity of ITO samples.

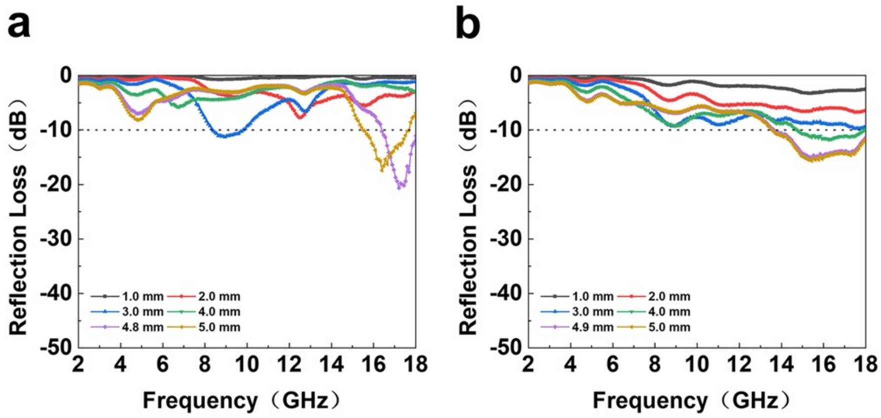

Fig. S7. Reflection loss for (a) ITO-25 and (b) ITO-30.

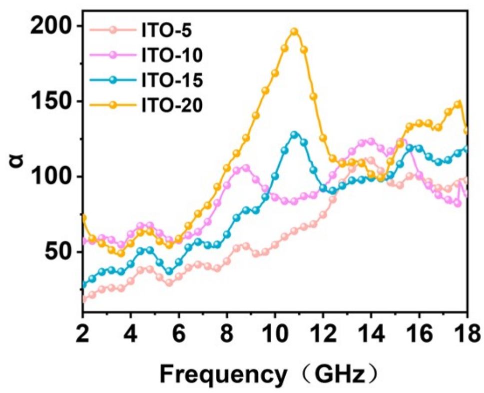

Fig. S8. Attenuation constants for ITO-5, ITO10, ITO-15 and ITO-20.