Supplementary Information

First-principles calculation. The simulation was performed using the Vienna ab-initio simulation package (VASP) based on Heyd-Scuseria-Ernzerhof (HSE) screened hybrid functional. The Monkhorst-Pack scheme was applied in order to sample the Brillouin zone, and the interaction between the valence electrons and the core was depicted using the projected augmented wave (PAW) method. For the primitive cell model of Ti_3O_5, the plane wave cutoff of 660 eV and the k-point of 9×9×5 were used.

Synthesis of Sc/λ-Ti_3O_5. The main raw materials were purchased from Aladdin company, including Sc_2O_3 (> 99.99 wt.%, CAS: 12060-08-1) and TiO_2 (> 99.99 wt.%, CAS: 13463-67-7). The samples were prepared by hydrogen reduction method. Sc_2O_3 and TiO_2 were mixed homogeneously at 0.02-0.06 scandium-titanium atomic ratio, subsequently, they were put into quartz boats. The high-temperature tube furnace was used to treat the quartz boats in a 1200 °C under hydrogen atmosphere for an hour. In order to avoid the influence of the product of water vapor on the reaction rate, the flow rate of hydrogen gas was kept at 1.5 L/min in the process of high temperature reduction.

Structure Characterization. FESEM (Field-emission scanning electron microscopy, JEOL, JSM-7100F) and TEM (Transmission electron microscopy, JEOL, JEM-2100F) were used to analyze the morphology and microstructure of the Sc/λ-Ti_3O_5. XRD (X-ray diffraction was characterized by a Rigaku SmartLab X-ray diffractometer with Cu Kα, λ=0.154 nm, radiation at a voltage of 35 kV and a current of 200 mA at a scan step of 0.04°) was used to characterize the structure of the Sc/λ-Ti_3O_5. XPS (X-ray photoelectron spectroscopy, Shimazu-Kratos Analytical Model Axis Supra) was used to test the chemical states of elements. VNA (Agilent PNA N5222A vector network analyzer) was used to test the electromagnetic parameters in the range of 2-18 GHz. The samples were uniformly mixed with the paraffin at a mass fraction of 50 wt.% of the microwave measurements.

Table S1. The optimized lattice parameters of λ-Ti_3O_5 and Sc/λ-Ti_3O_5 primitive cells.

	λ-Ti_3O_5	Sc/λ-Ti_3O_5
a (Å)	5.29526	5.33128
b (Å)	5.29526	5.33128
c (Å)	10.00901	10.15964
α (º)	91.2015	90.6663
β (º)	91.2015	90.6663
γ (º)	42.1844	42.0826
V ($Å^3$)	188.414063	193.514259

Table S2. The optimized atomic coordinates of λ-Ti_3O_5 and Sc/λ-Ti_3O_5 primitive cells.

	λ-Ti_3O_5			Sc/λ-Ti_3O_5		
	x/a	y/b	z/c	x/a	y/b	z/c
O1	0.44830	0.44830	0.38548	0.45266	0.45266	0.39028
O2	0.17891	0.17891	0.06400	0.18704	0.18704	0.05966
O3	0.73700	0.73700	0.25033	0.71946	0.71946	0.25058
O4	0.54475	0.54475	0.86768	0.54871	0.54871	0.87322
O5	0.18870	0.18870	0.42637	0.19022	0.19022	0.43689
O6	0.55170	0.55170	0.61452	0.55035	0.55035	0.61953
O7	0.82109	0.82109	0.93600	0.81885	0.81885	0.92822
O8	0.26300	0.26300	0.74967	0.26641	0.26641	0.74961
O9	0.45525	0.45525	0.13232	0.45327	0.45327	0.11666
O10	0.81130	0.81130	0.57363	0.81190	0.81190	0.57446
Ti1	0.62924	0.62924	0.04893	0.63304	0.63304	0.05162
Ti2	0.30295	0.30295	0.24399	\	\	\
Ti3	0.63508	0.63508	0.43522	0.63597	0.63597	0.44215
Ti4	0.37076	0.37076	0.95107	0.36939	0.36939	0.94016
Ti5	0.69705	0.69705	0.75601	0.69707	0.69707	0.75208
Ti6	0.36492	0.36492	0.56478	0.36569	0.36569	0.56550
Sc	\	\	\	0.29998	0.29998	0.24939