

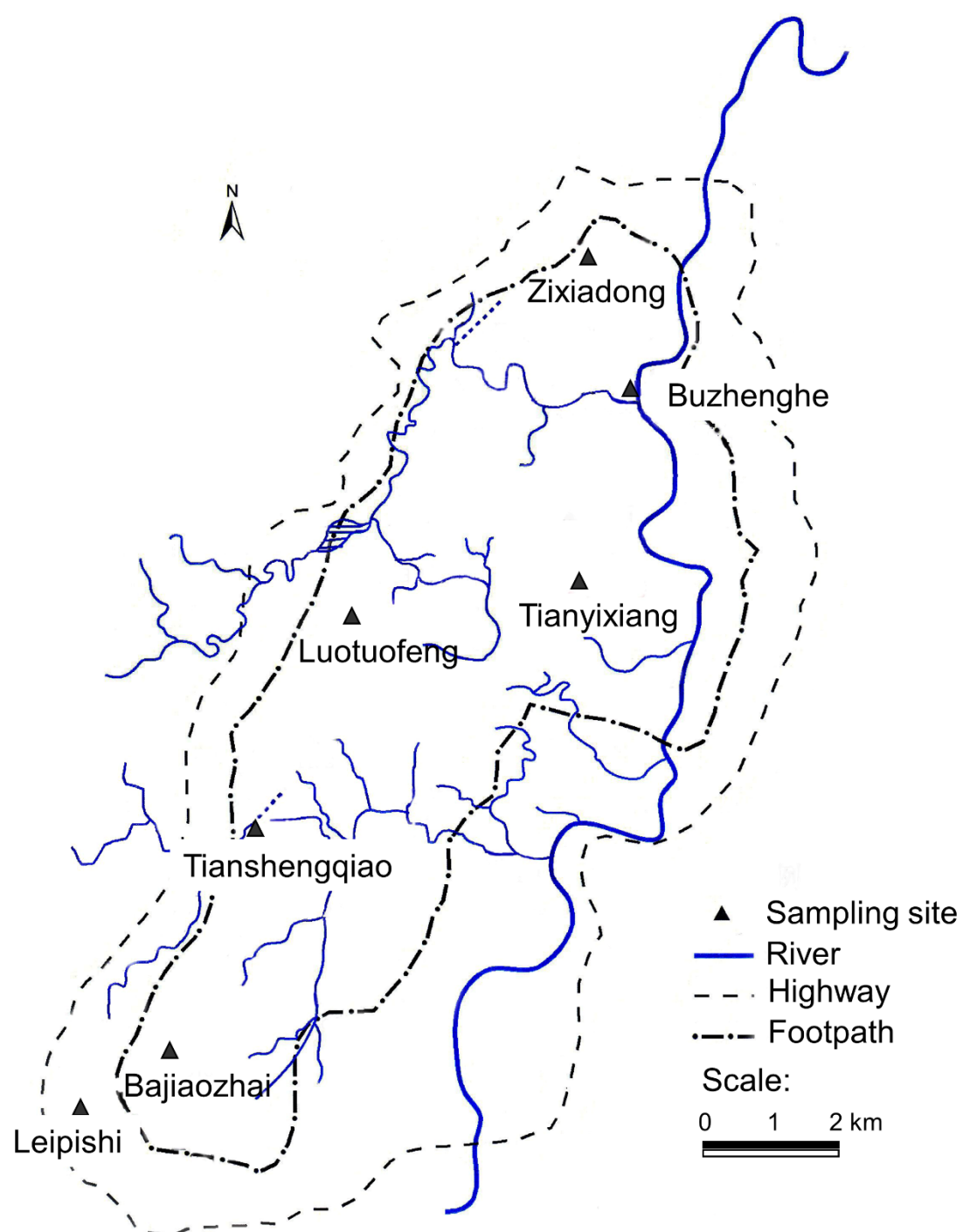


Figure S1. The distribution map of sampling sites in Lang mountain geopark.

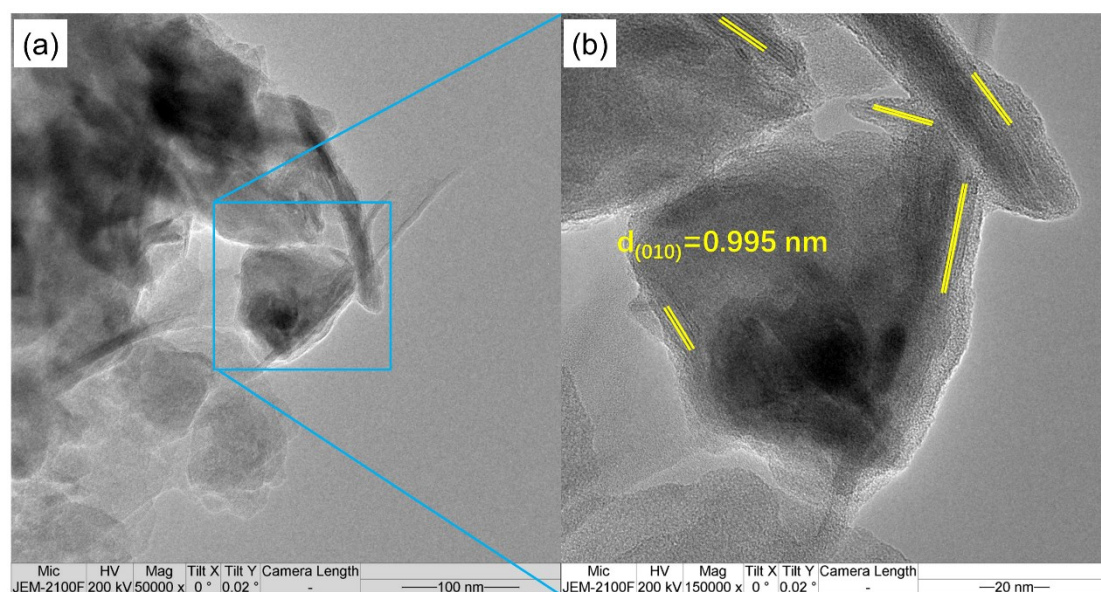


Figure S2. The TEM images of some mineral nanoparticles (a) and the identification of goethite through its interplanar spacing of (010) (b).

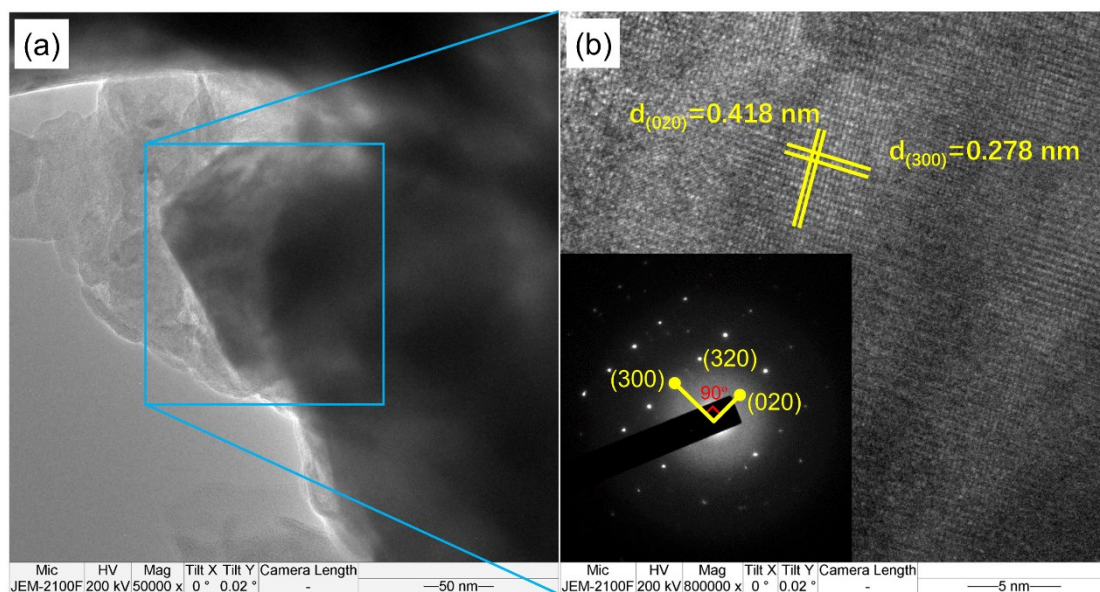


Figure S3. The TEM images of a well-crystalline maghemite particle (a) and its lattice fringes (b). Inset: selected area electron diffraction pattern and its identification.

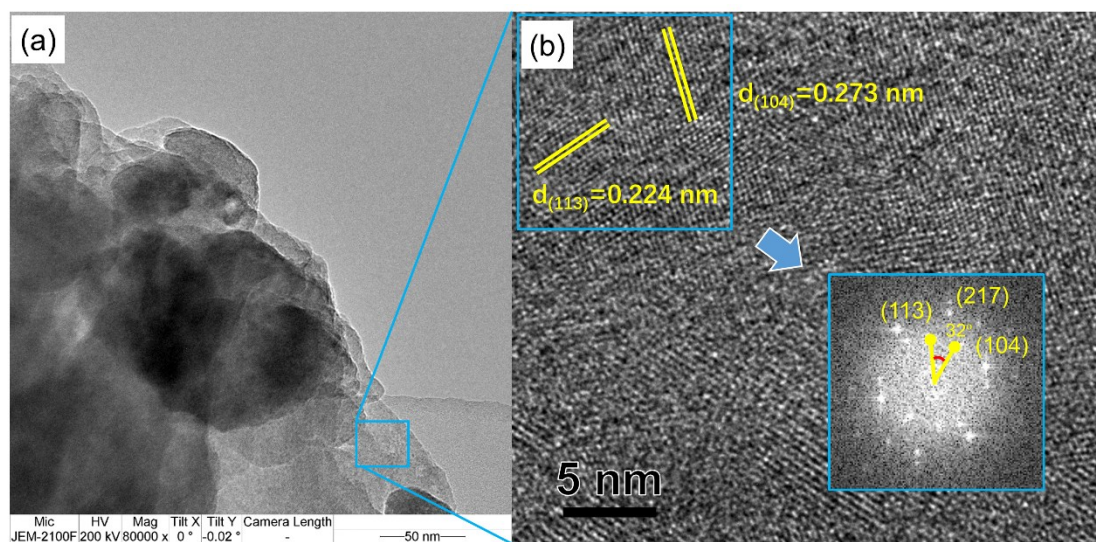


Figure S4. The TEM images of ilmenite (a) and its lattice fringes (b). Inset: simulated fast Fourier transform pattern and its identification.

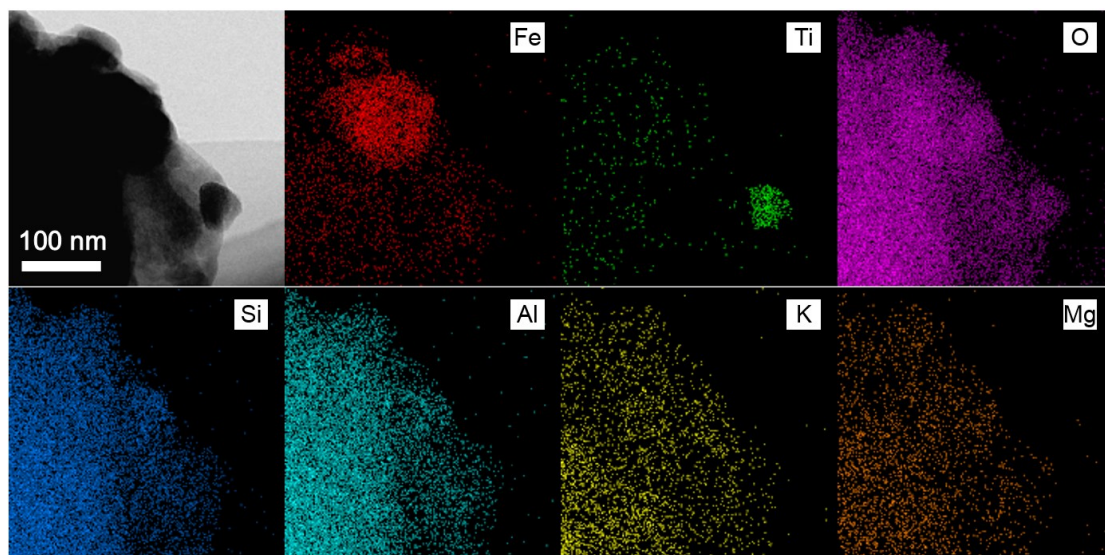


Figure S5. Some element distribution mappings in selected area of some mineral particles detected in EDX of TEM.

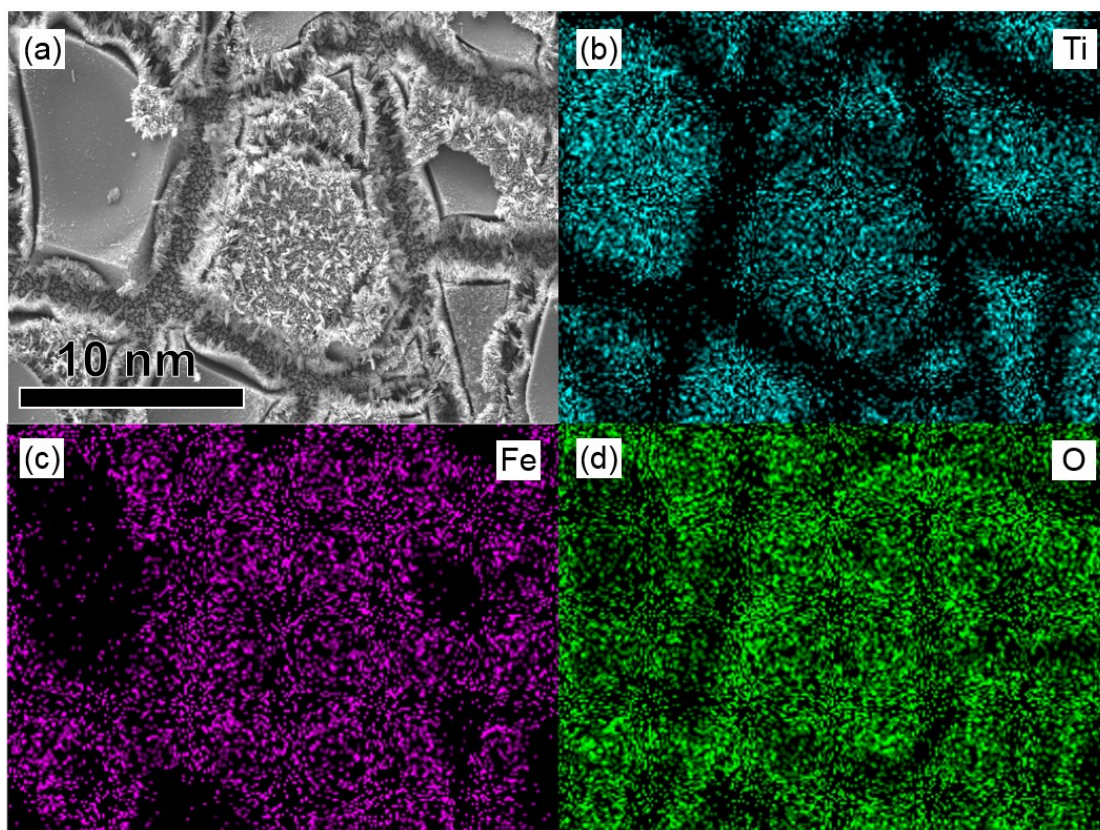


Figure S6. EDX elementary mappings for the synthesized $\text{Fe}_2\text{O}_3\text{-TiO}_2$ sample: (a) SEM image, (b) Ti pattern, (c) Fe pattern, (d) O pattern.

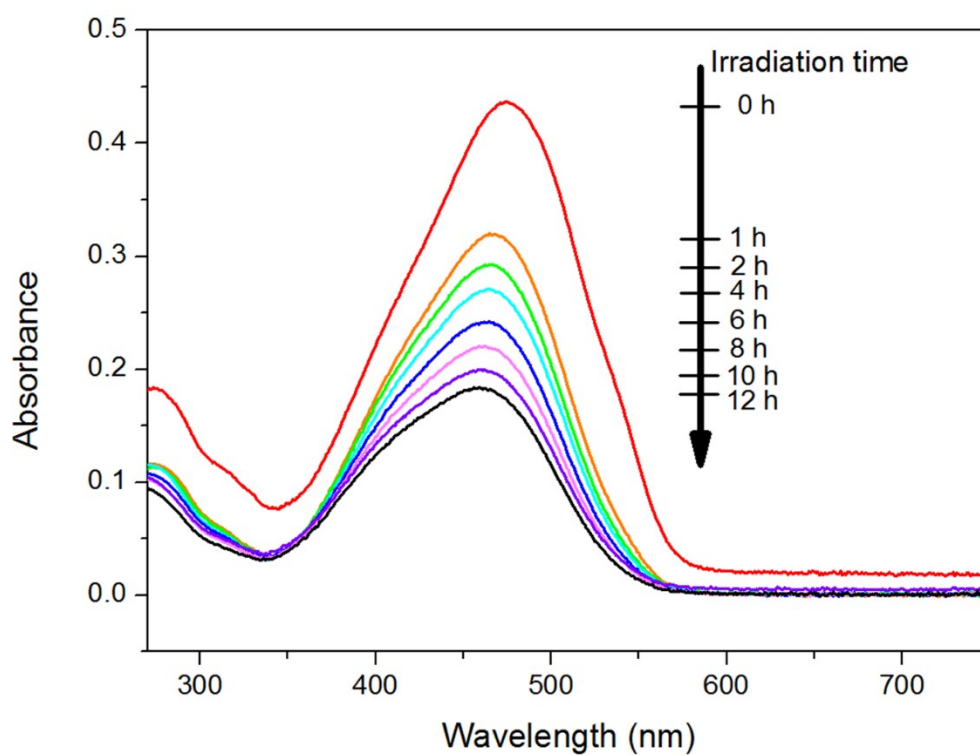


Figure S7. The change of absorption spectra of MO with irradiated time in the presence of coupled $\text{Fe}_2\text{O}_3\text{-TiO}_2$.

Table S1. The location of sampling sites.

Name	Abbreviated name in text	location
Tianyixiang	TYX	26°21'20"N, 110°48'6"E
Luotuofeng	LTF	26°20'29"N, 110°45'44"E
Bajiaozhai	BJZ	26°16'34"N, 110°44'1"E
Zixiadong	ZXD	26°20'30"N, 110°45'47"E
Tianshengqiao	TSQ	26°16'34"N, 110°44'1"E
Leipishi	LPS	26°16'46"N, 110°43'60"E
Buzhenghe	BZH	26°16'1"N, 110°42'50"E

Table S2. The concentration of major elements of sandstone samples through XRF method (wt%).

Sampling sites	Lithology	SiO ₂	Al ₂ O ₃	TFe ₂ O ₃	CaO	MgO	K ₂ O	Na ₂ O	MnO	TiO ₂	P ₂ O ₅	LOI	Total %
TYX	sandstone	72.43	14.59	1.30	0.84	1.19	4.83	1.48	0.040	0.165	0.139	2.64	99.64
LTF	siltstone	60.54	19.36	4.09	1.15	3.71	4.92	0.36	0.067	0.573	0.166	4.66	99.59
BJZ	sandstone	69.74	15.60	1.67	2.14	1.52	5.52	0.21	0.040	0.190	0.025	3.15	99.80
ZXD	pebbly sandstone	69.33	14.67	1.69	3.49	1.76	4.42	0.44	0.038	0.199	0.081	3.75	99.86
BZH	sandstone	67.79	16.98	3.26	0.53	2.33	4.71	0.08	0.045	0.379	0.016	3.70	99.82
	limestone	74.02	12.69	0.86	3.09	1.13	4.39	0.54	0.032	0.125	0.072	2.81	99.74