

## Electronic Supplementary Information

### Chemical Synthesis of Unique Intermetallic TiFe Nanostructures Originating from the Morphology of Oxide Precursors

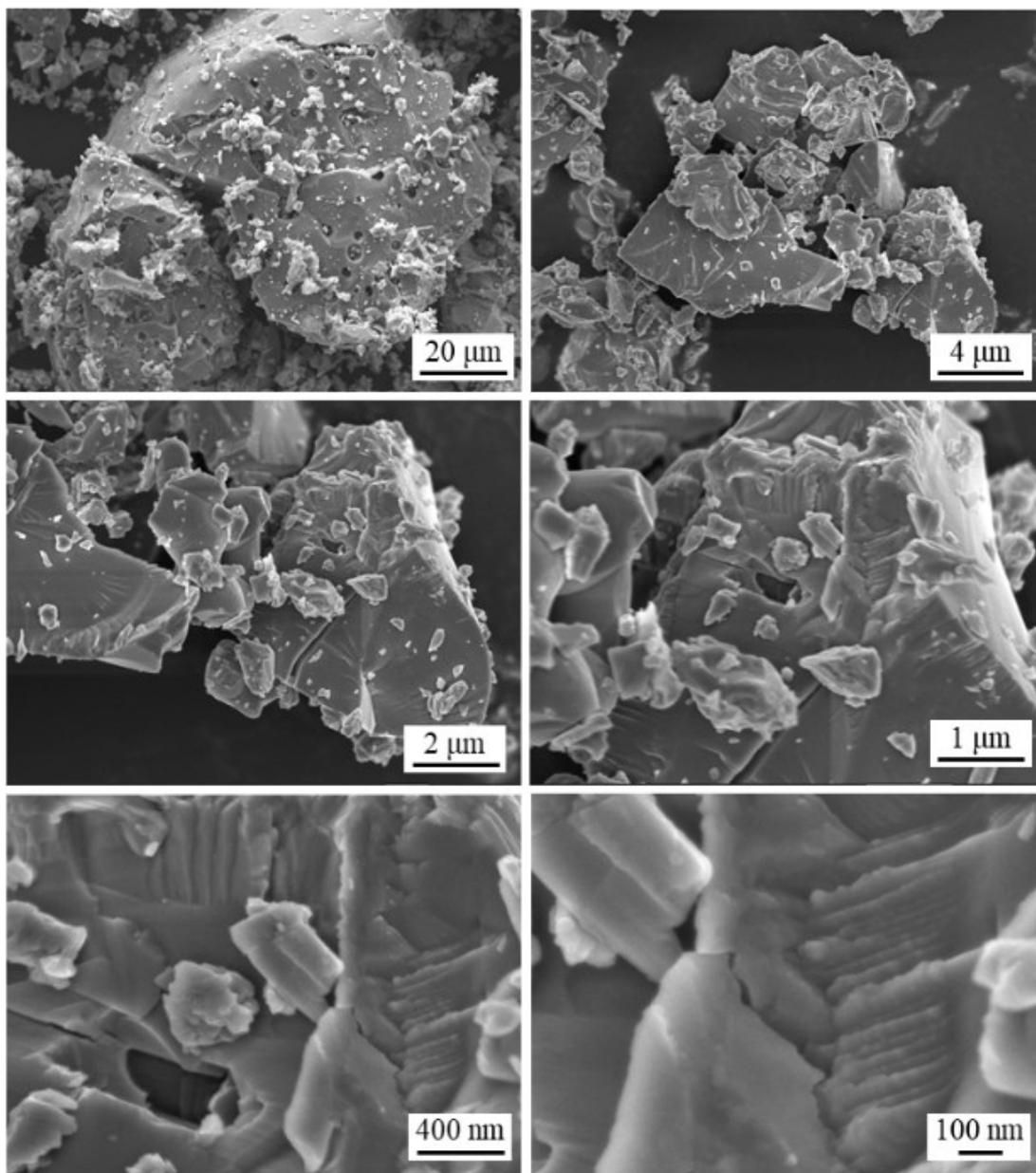
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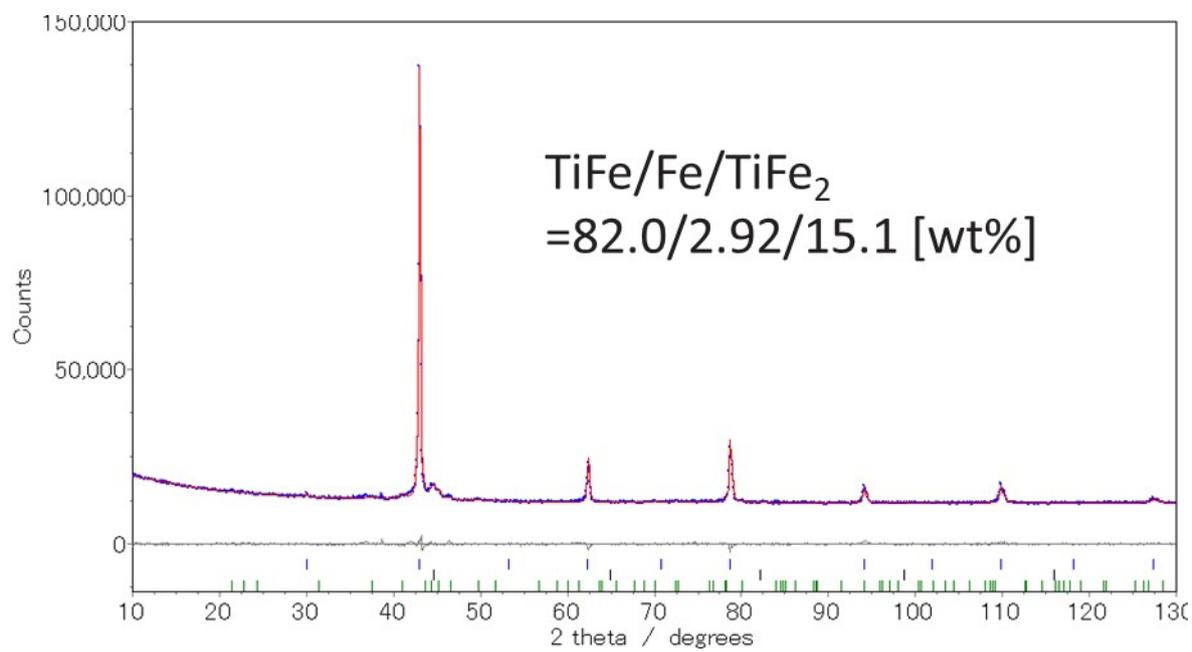
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b Waseda Research Institute for Science and Engineering, Waseda University, Tokyo 169-8555, Japan

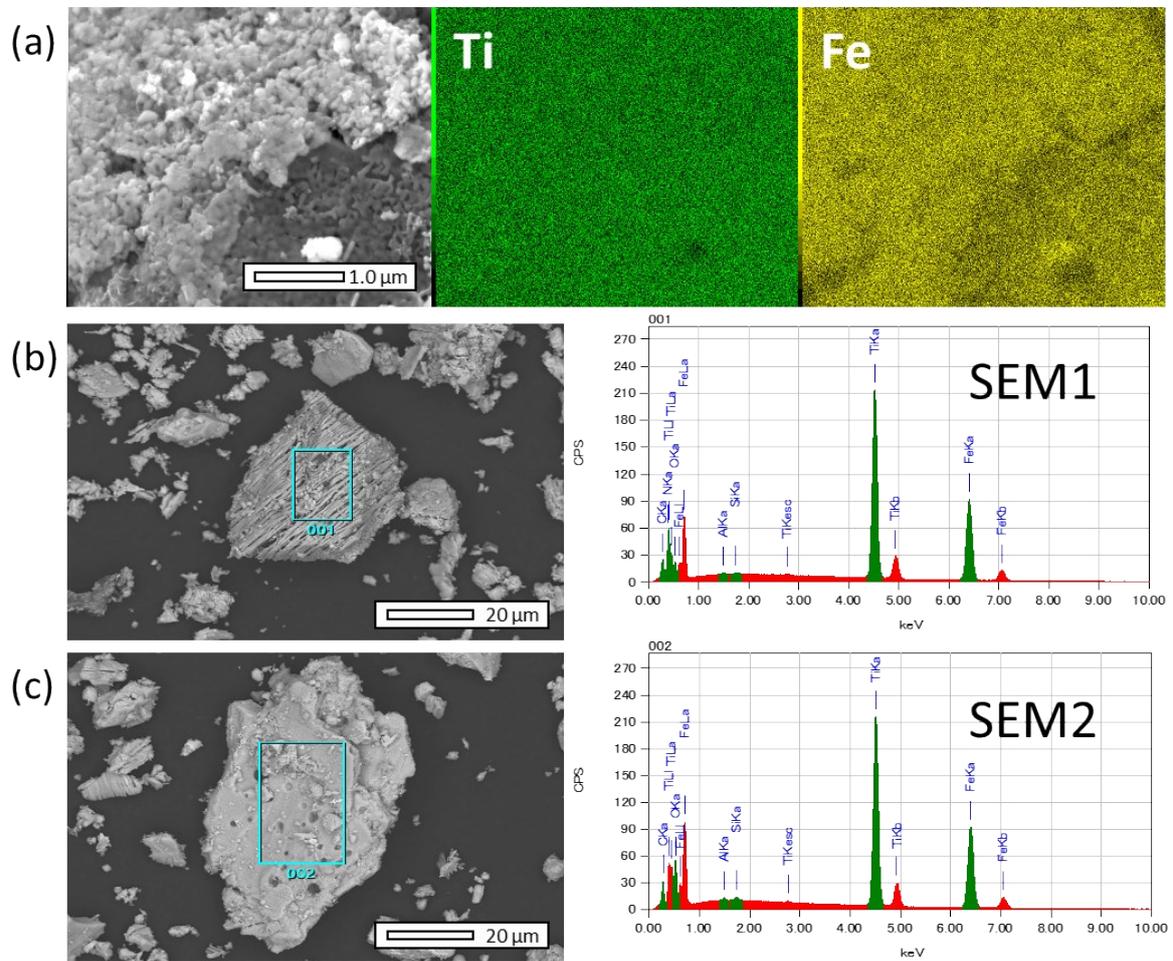
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**Fig. S1** SEM images for commercial FeTiO<sub>3</sub>.



**Fig. S2** Rietveld refinement results for TiFe(RDT-FTO). Observed (blue dots), calculated (red line), and difference (gray line) profiles are presented. The vertical bars at the bottom show the calculated positions for TiFe (blue), Fe (black) and TiFe<sub>2</sub> (green).

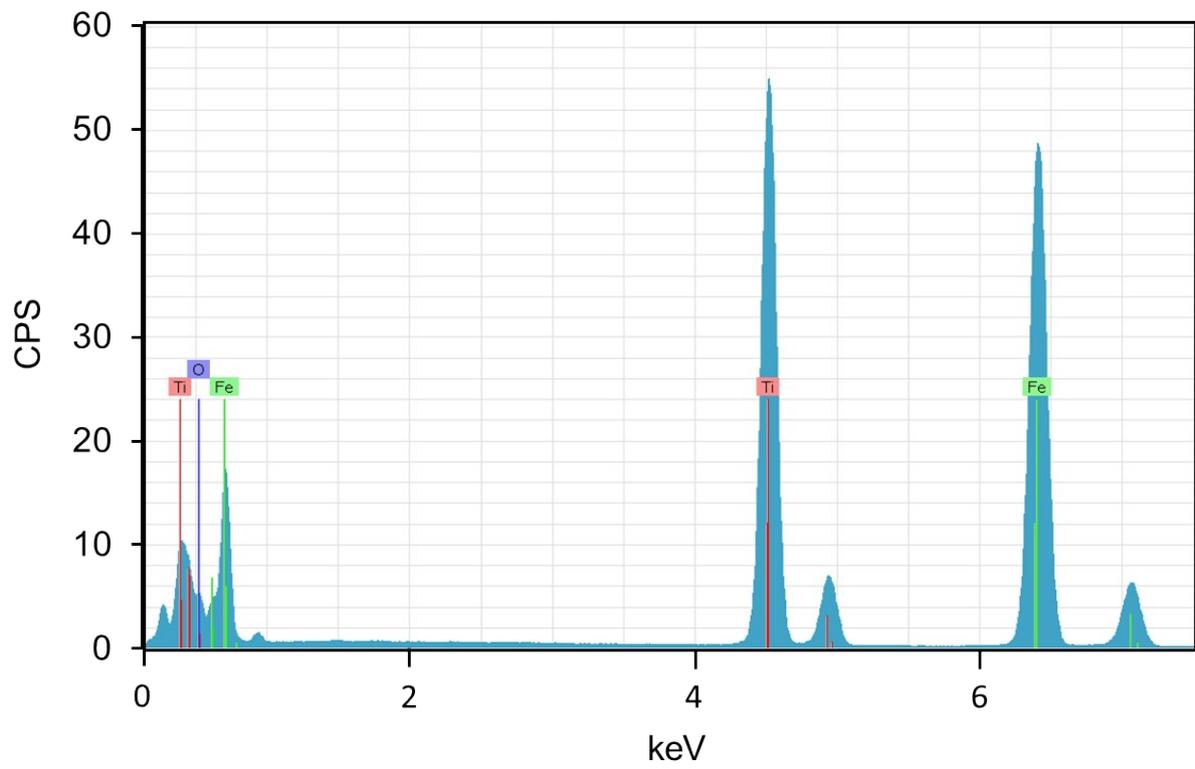


**Fig. S3** (a) Elemental mappings and SEM-EDS analysis at two positions of (b) SEM1 and (c) SEM2 for TiFe (RDT-FTO).

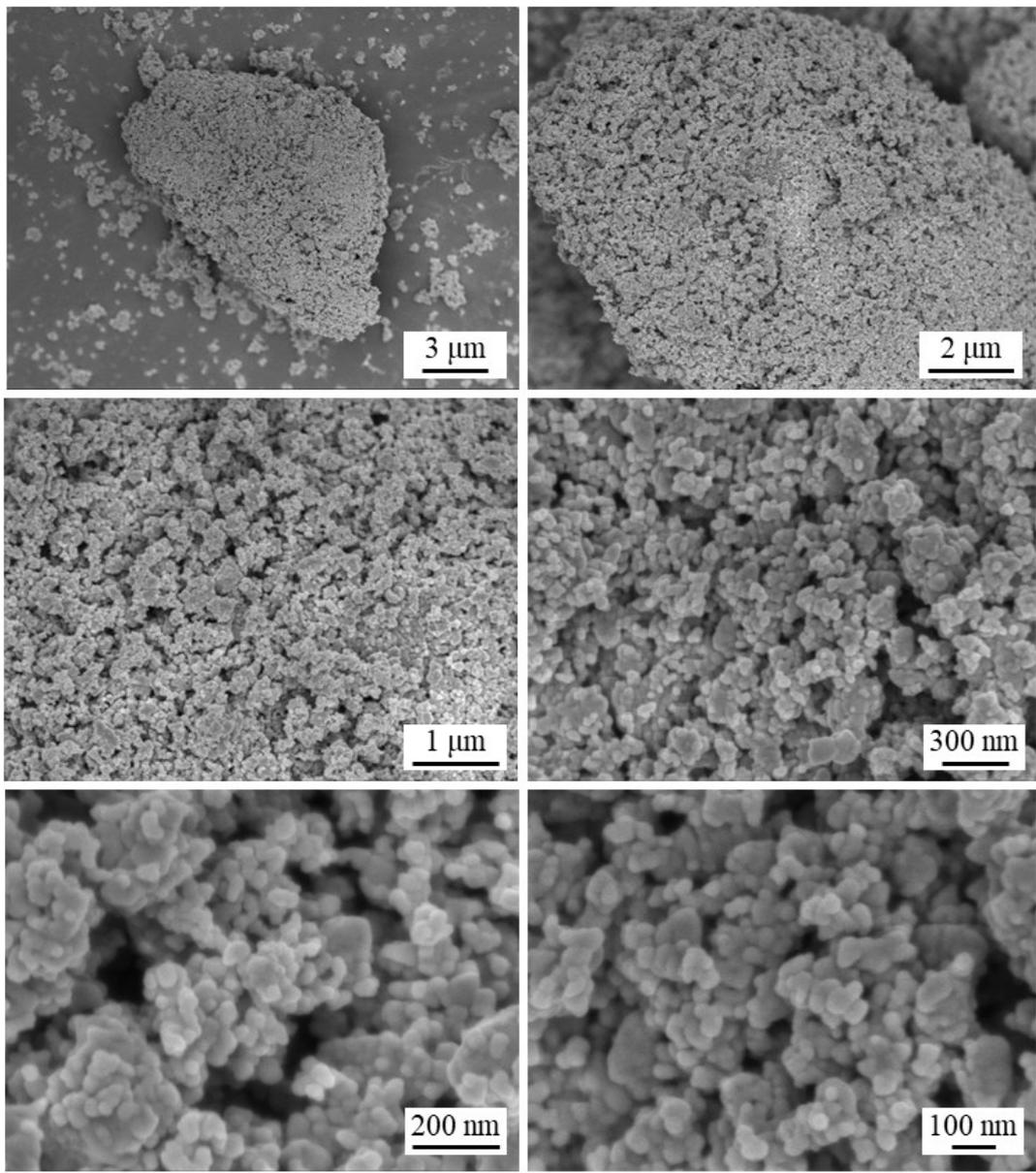
**Table S1** Molar ratios of detected elements by SEM-EDS for TiFe (RDT-FTO) and TiFe (RDT-TO).

Sample	Molar ratio of detected elements [mol%]						
	Method <sup>a)</sup>	Ti	Fe	O	Al	Si	Ca
TiFe(RDT-FTO)	SEM1	46.34	49.14	4.27	0.17	0.08	-
	SEM2	43.06	45.46	11.07	0.18	0.23	-
TiFe(RDT-TO)	SEM1	43.59	47.52	8.19	0.14	0.21	0.35
	SEM2	43.50	46.40	9.28	0.19	0.33	0.30

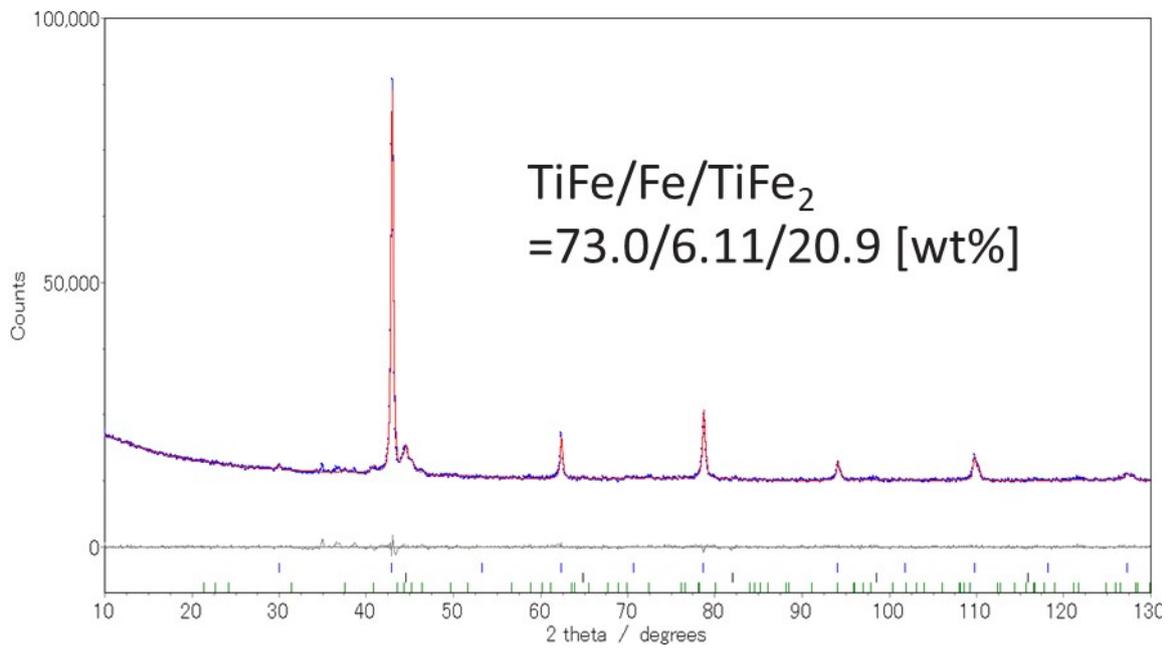
a) Element ratios were measured at 2 different positions of SEM1 and SEM2 for both samples.



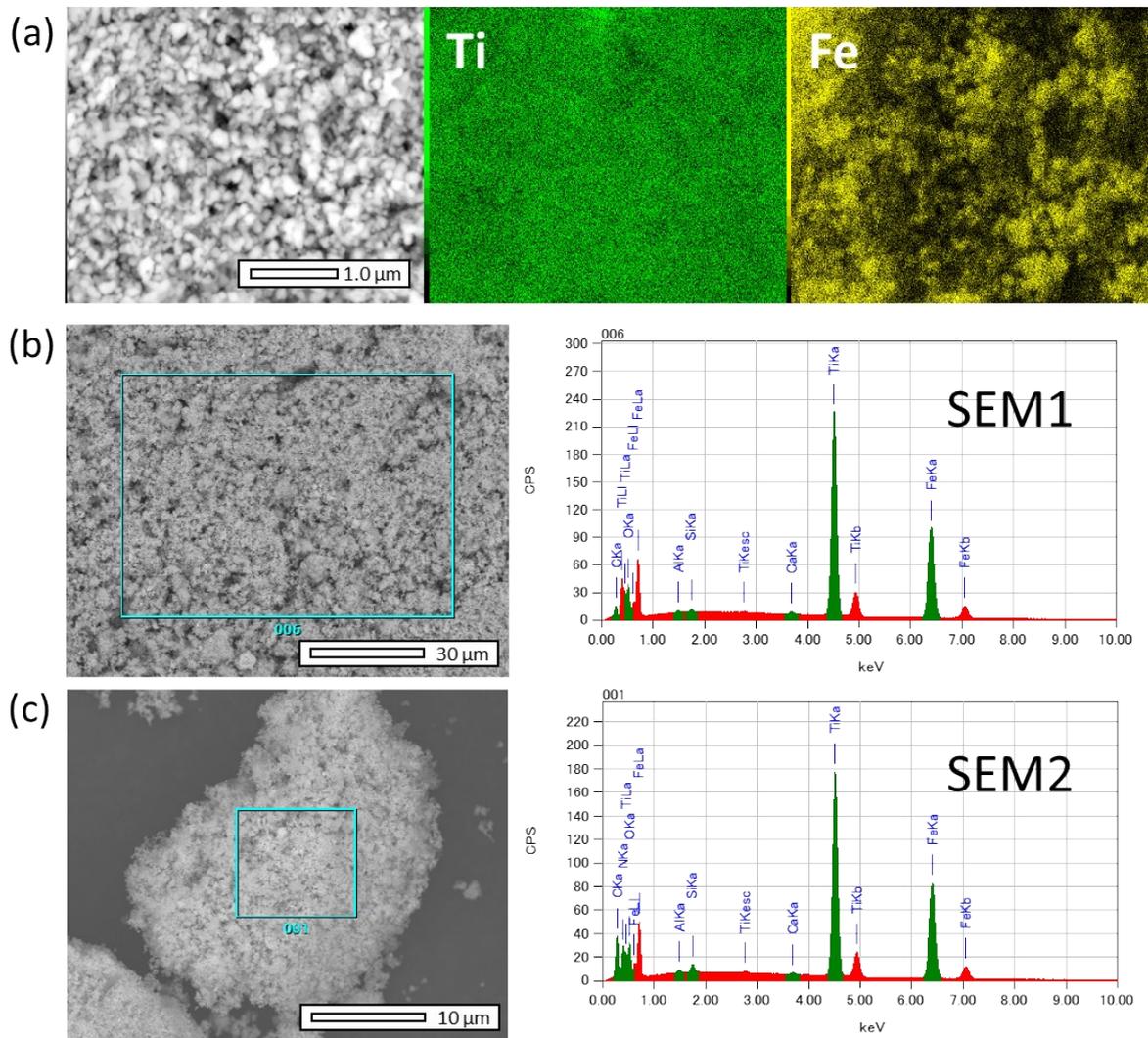
**Fig. S4** TEM-EDS spectrum observed at a marked position in Fig. 2(b) for TiFe (RDT-FTO).



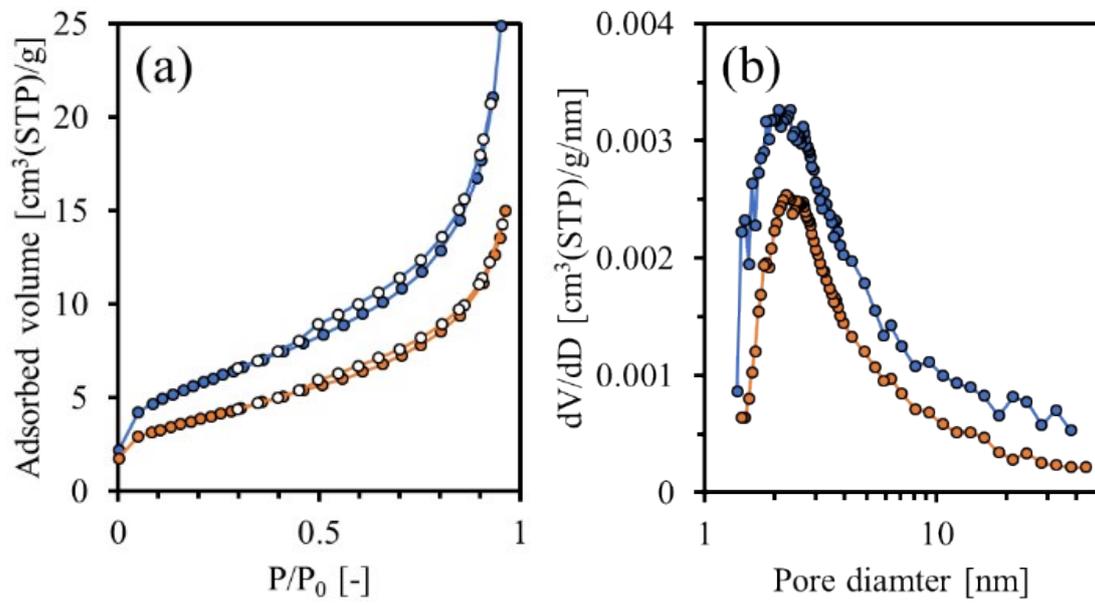
**Fig. S5** SEM images for TiFe (Pre-TO).



**Fig. S6** Rietveld refinement results for TiFe(RDT-TO). Observed (blue dots), calculated (red line), and difference (gray line) profiles are presented. The vertical bars at the bottom show the calculated positions for TiFe (blue), Fe (black) and TiFe<sub>2</sub> (green).



**Fig. S7** (a) Elemental mappings and SEM-EDS analysis at two positions of (b) SEM1 and (c) SEM2 for TiFe (RDT-TO).



**Fig. S8** (a) Adsorption and desorption isotherms of nitrogen and (b) pore size distributions. Orange: TiFe (RDT-FTO), Blue: TiFe (RDT-TO).