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Supporting information for:

When protein-based biomineralization meets hydrothermal synthesis: the nanostructures of the as-prepared materials are independent of the protein types

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1 Materials and instruments

Unless noted otherwise, all reagents were of analytical grade and used without further purification. Bovine serum albumin (BSA), catalase (2,000-5,000 units/mg protein), lysozyme, $FeCl_3$ were purchased from Sigma. Egg while were extracted from fresh eggs and used directly without post-processing.

Raman spectra were obtained on Renishaw RM1000 confocal Raman spectrometer (Renishaw, UK). TEM was performed using an FEI Titan G2 60-300 with spherical aberration correction, and FE-SEM images were obtained with a Helios NanoLab 600i Dual Beam FIB/FE-SEM (FEI, USA). X-ray photoelectron spectroscopy (XPS) analysis was conducted on an ESCALAB 250Xi XPS (Thermo Fisher, USA). Powder X-ray diffraction (XRD) patterns of the samples were measured on a Rigaku D/max 2550 X-ray diffractometer with Cu Kα radiation (λ = 0.15418 nm) (Japan). Thermal gravimetric analyses (TGA) were carried out with a TG-209 F3 instrument (NETZSCH, Germany) under an air atmosphere. Nitrogen adsorption−desorption isotherms were measured with a micromeritics analyzer from Beijing JWGB Sci & Tech Co., Ltd. (Beijing, China)

2 Characterizations

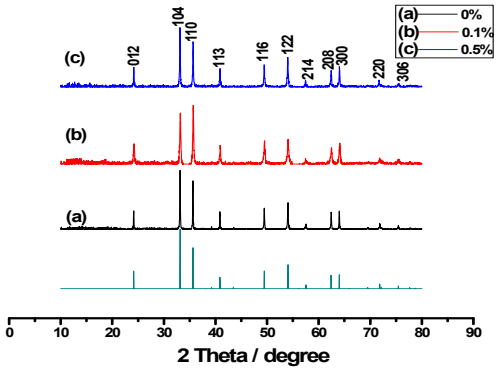

Figure S1. XRD patterns of the as-prepared hematite samples obtained after 10 h via BSA-templated biomineralization ($[Fe^{3+}]$ = 0.06 M) with different protein concentrations: (a) 0%, (b) 0.1%, and (c) 0.5%.

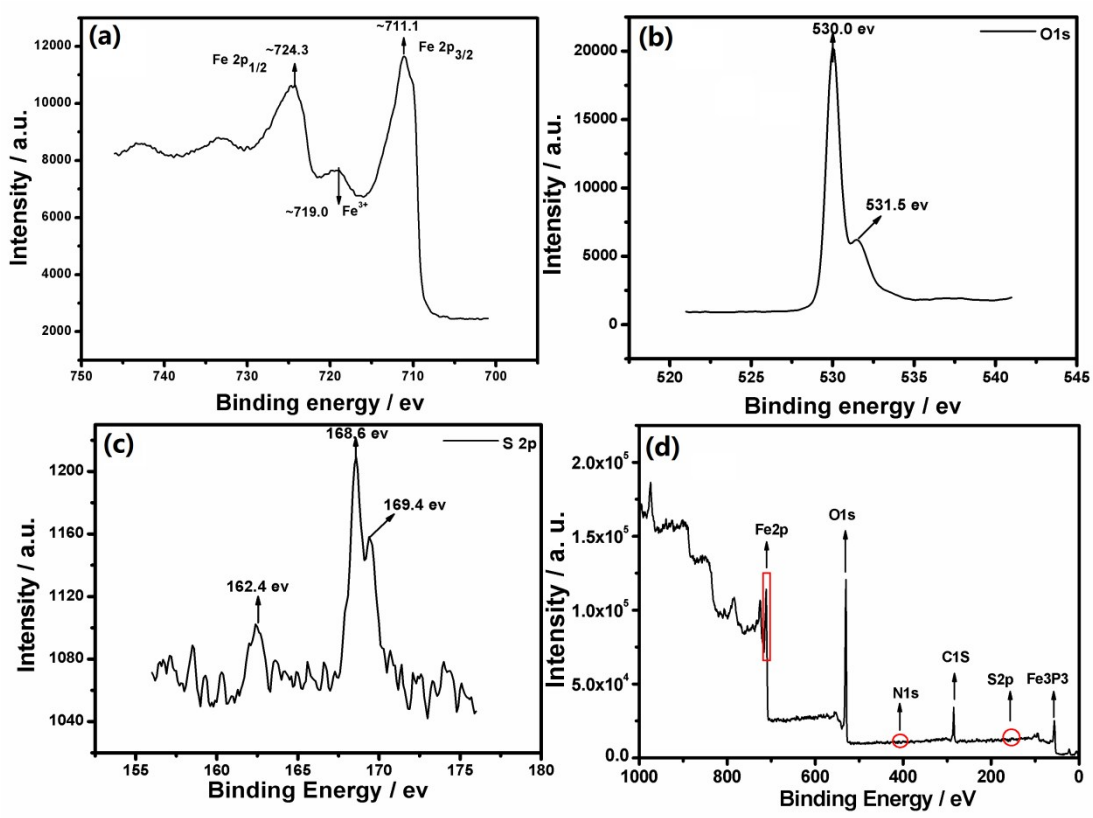

Fig. S2 XPS spectra of the olive-like hematite samples obtained after 10 h via BSA-templated biomineralization ([BSA] = 0.1wt%, [Fe^{3+}] = 0.06 M): (a) survey spectrum; (b) high-resolution of O1s spectrum; (c) high-resolution of S2p spectrum; (d) high-resolution of Fe2p spectrum.

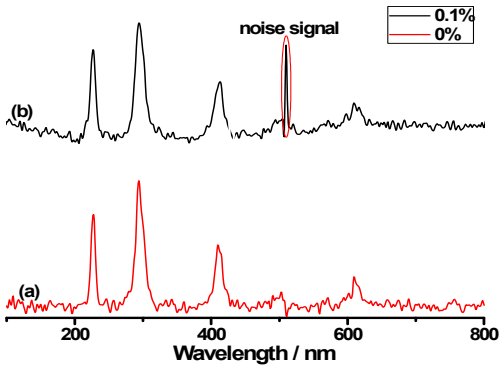

Fig.S3 Raman spectra of the as-prepared hematite samples obtained after 10 h via BSA-templated biomineralization ([Fe^{3+}] = 0.06 M) with different protein concentrations: (a) 0%, (b) 0.1%.

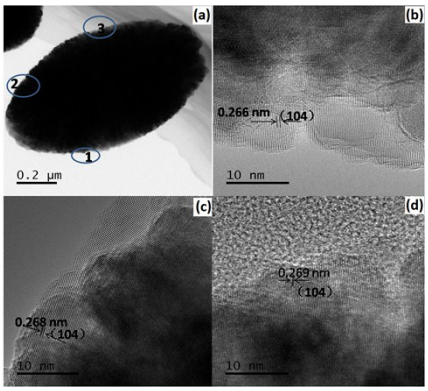

Fig.S4 (a) TEM image and corresponding selected area high-resolution TEM images (b↔1, c↔2, d↔3 respectively) of the olive-like hematite samples obtained after 10 h via BSA-templated biomineralization ([BSA] = 0.1 wt %, [Fe^{3+}] = 0.06 M)

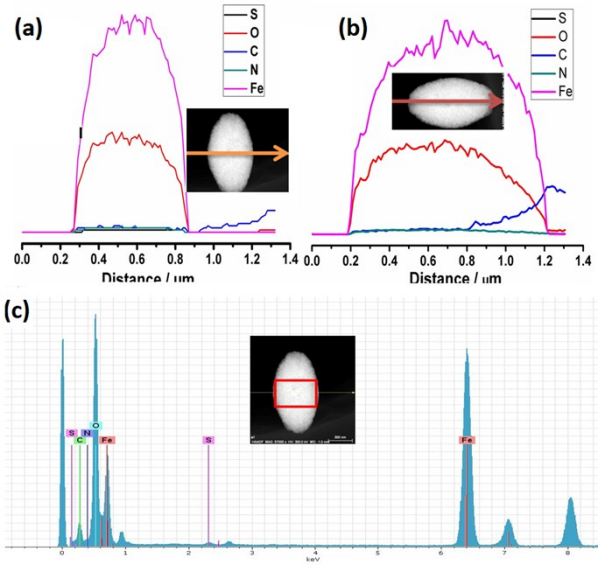

Fig.S5 Distribution of the components in the BSA-biomineralized hematite mesocrystals obtained by the line-scan analysis using STEM-EDS: (a) along the long axis (b) along the short axis (c) EDX spectrum of the selected area

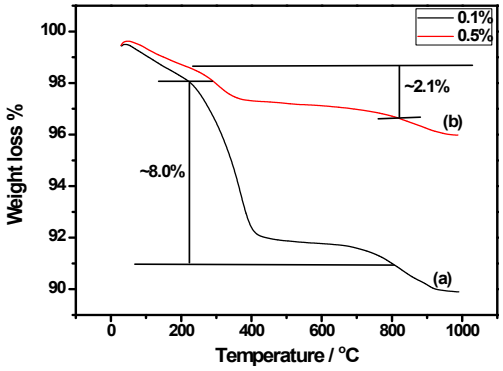

Fig.S6 TGA curves of hematite samples obtained after 10 h via BSA-templated biomineralization ([Fe^{3+}] = 0.06 M) with different protein concentrations: (a) 0.1%, (b) 0.5%.

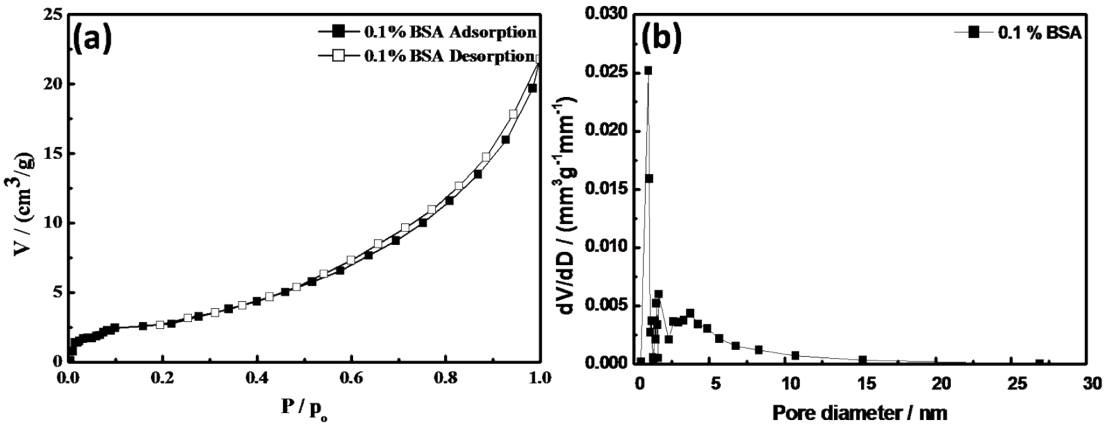

Figure S7 (a) Nitrogen adsorption/desorption isotherms, and (b) corresponding BJH pore sizes distribution plot of the olive-like hematite samples obtained after 10 h via BSA-templated biomineralization ([BSA] = 0.1 wt %, [Fe^{3+}] = 0.06 M).

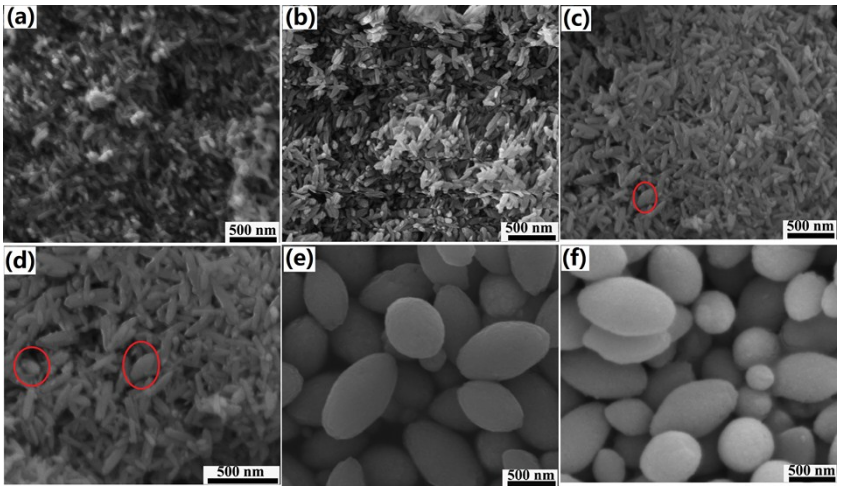

Fig.S8 FE-SEM images of hematite samples obtained via BSA-templated biomineralization ([BSA] = 0.1 wt %, [Fe^{3+}] = 0.06 M) with different reaction time: (a) 60 min; (b) 90 min; (c) 100 min; (d) 120 min; (e) 240 min; and (f) 360 min.

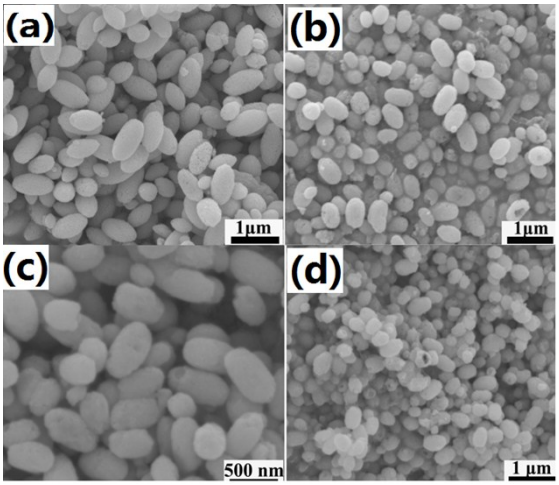

Fig.9 FE-SEM images of hematite samples obtained after 10 h via BSA-templated biomineralization ([Fe^{3+}] = 0.06 M) with different protein concentrations: (a) 0.25 wt%; (b) 0.5 wt%; (c) 0.75; and (d) 1%.

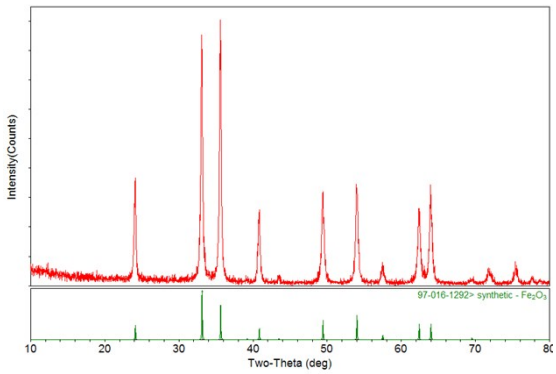

Figure S10. XRD patterns of the as-prepared hematite samples obtained after 10 h via egg white-templated biomineralization ([Fe^{3+}] = 0.06 M, [egg white] = 0.1 wt%)