

Electronic Supplementary Information

Synthesis of String-Bean-like Anisotropic Titania Nanoparticles with Basic Amino Acids

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Experimental Section

Materials. Titanium isopropoxide, titanium tetraethoxide, titanium tetrabutoxide, sodium hydroxide (50 wt% NaOH in water), nitric acid, triethanolamine, arginine, and lysine were purchased from Wako Pure Chemical Industries Ltd. All chemicals were used as received without any further purification. Milli-Q water (18.2 M Ω) was used for all experiments.

Characterization. SEM images were taken on a Hitachi S-900 instrument with an accelerating voltage of 6 kV. Samples were prepared by spin-coating of the colloidal nanoparticles onto silicon wafers. Before observation, a layer of Pt was deposited on the SEM samples by sputtering with a Hitachi E-1030 instrument for 10s. TEM images were obtained with a JEOL JEM-2800 transmission electron microscope at an accelerating voltage of 200 kV. Nitrogen adsorption and desorption isotherms were obtained at 77 K using Autosorb-iQ (Quantachrome Instruments). Before measurements, samples were degassed at 300 °C for 8 h. The Brunauer–Emmett–Teller (BET) specific surface areas of samples were calculated from adsorption data at a relative pressure range of 0.05–0.2. The total pore volumes were evaluated from the adsorbed amount of nitrogen at a relative pressure of 0.99. The pore size distributions were obtained with the adsorption branches of the isotherms by the Barrett–Joyner–Halenda (BJH) method.

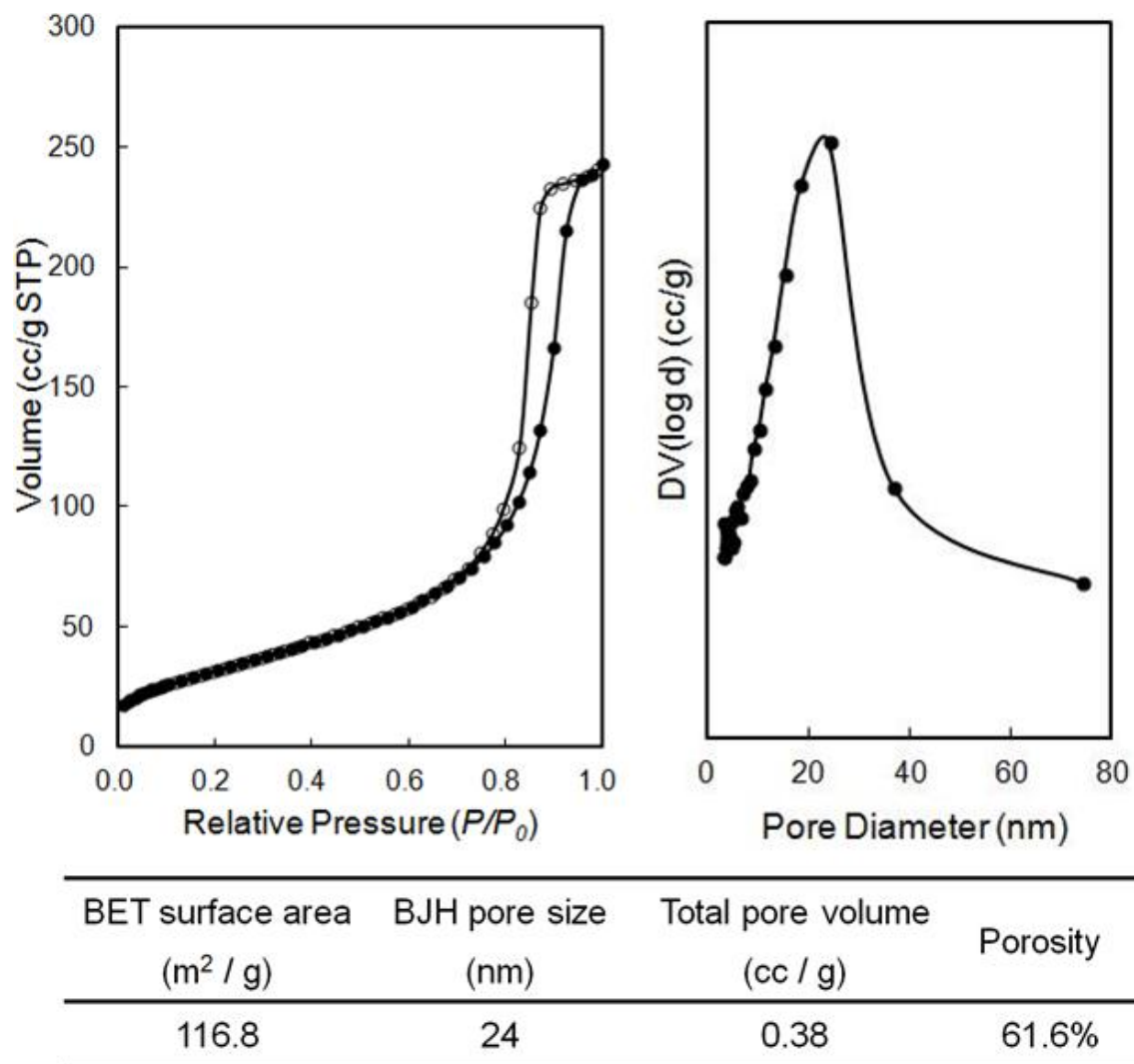


Fig. S1

Pore characteristics of string-bean-like anisotropic TiO_2 nanoparticles.

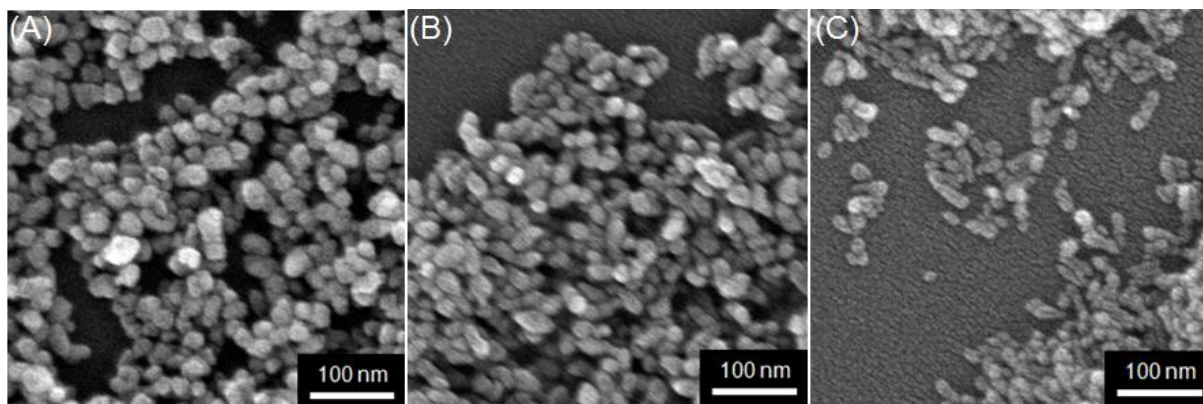


Fig. S2

SEM images of TiO₂ nanoparticles synthesized at 150 °C and varied concentrations of arginine: (A) 0, (B) 1, and (C) 5 wt%.

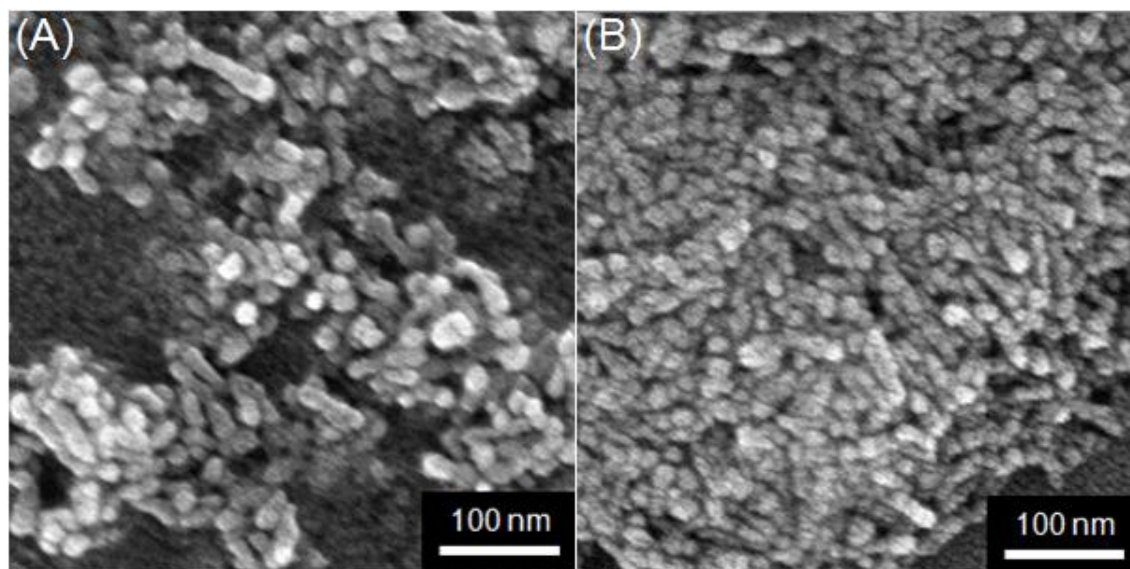


Fig. S3

SEM images of unpeptized string-bean-like TiO₂ nanoparticles synthesized at 150 °C with 10 wt% of arginine and different precursors: (A) titanium tetraethoxide and (B) titanium tetrabutoxide.

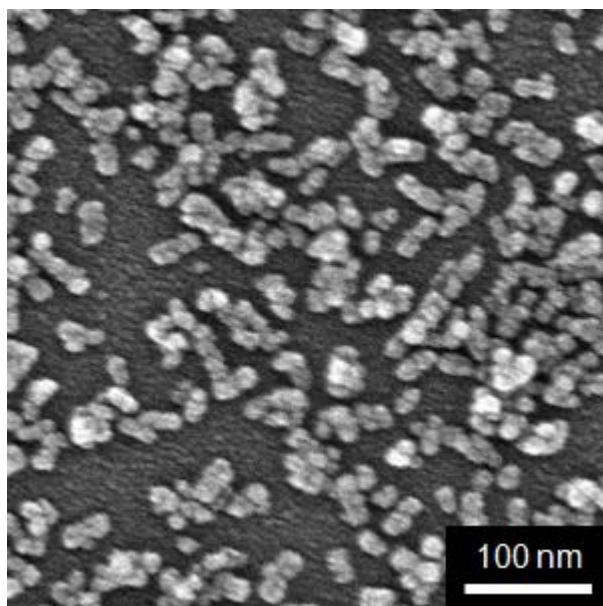


Fig. S4

SEM images of string-bean-like TiO₂ nanoparticles synthesized at 150 °C with lysine.

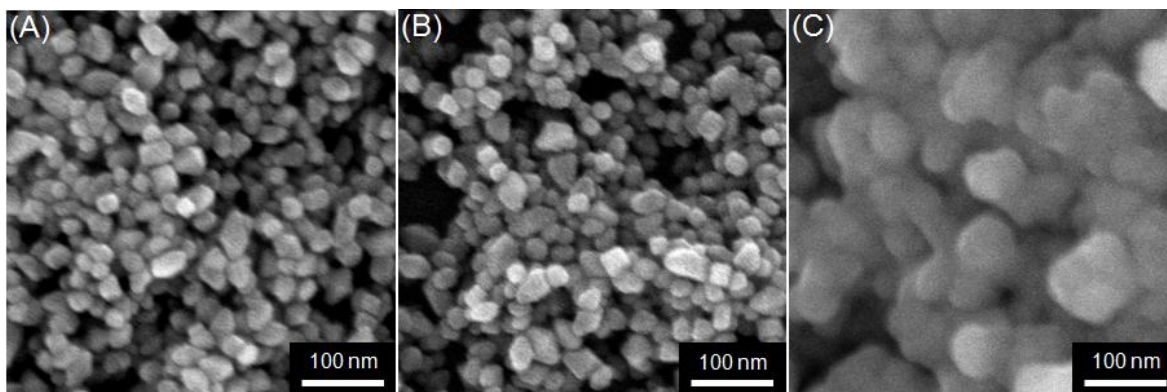


Fig. S5

SEM images of TiO₂ nanoparticles synthesized at 190 °C and varied concentrations of arginine: (A) 1, (B) 5, and (C) 10 wt%.

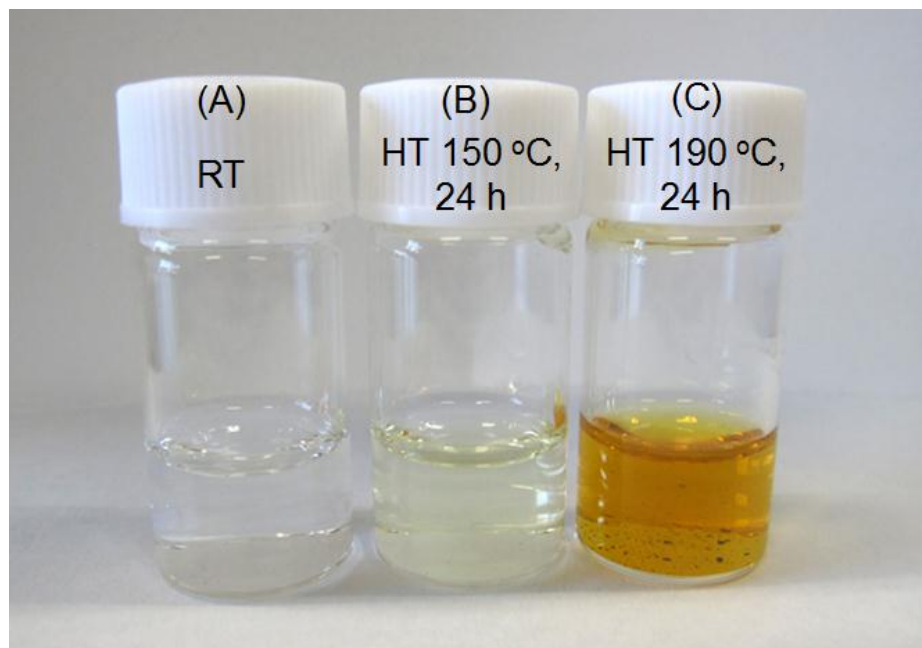


Fig. S6

Photographs of aqueous arginine solutions (10 wt%) after treatment at different temperature for 24 h :

(A) room temperature, (B) 150 °C, and (C) 190 °C.