

Electronic Supplementary Informations

Preparation of Three-Dimensionally Ordered Macroporous Tungsten Oxides and Nano-crystalline Particulate Tungsten Oxides using a Colloidal Crystal Template Method, and their Structural Characterization and Application as Photocatalysts under Visible Light Irradiation.

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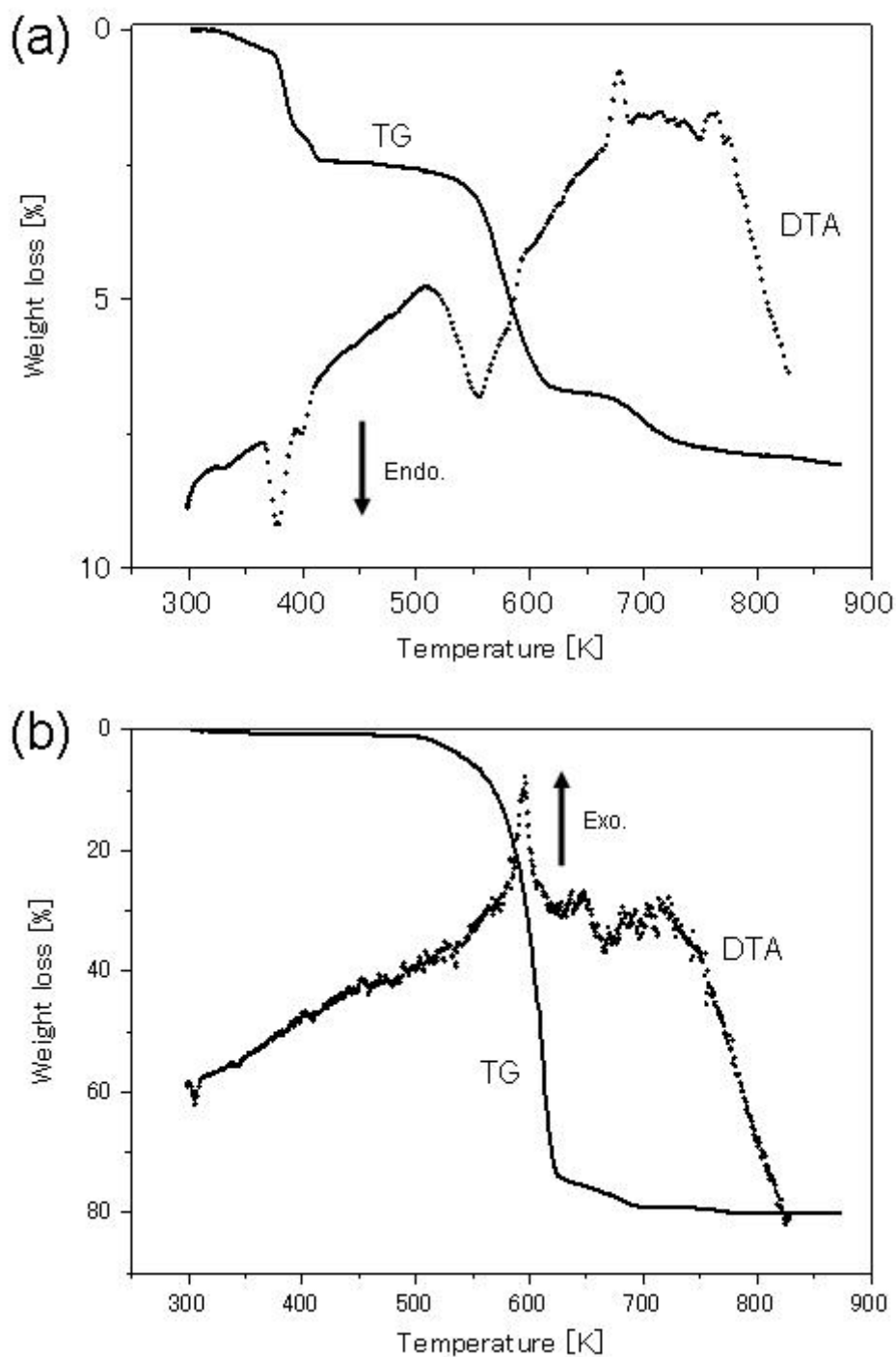
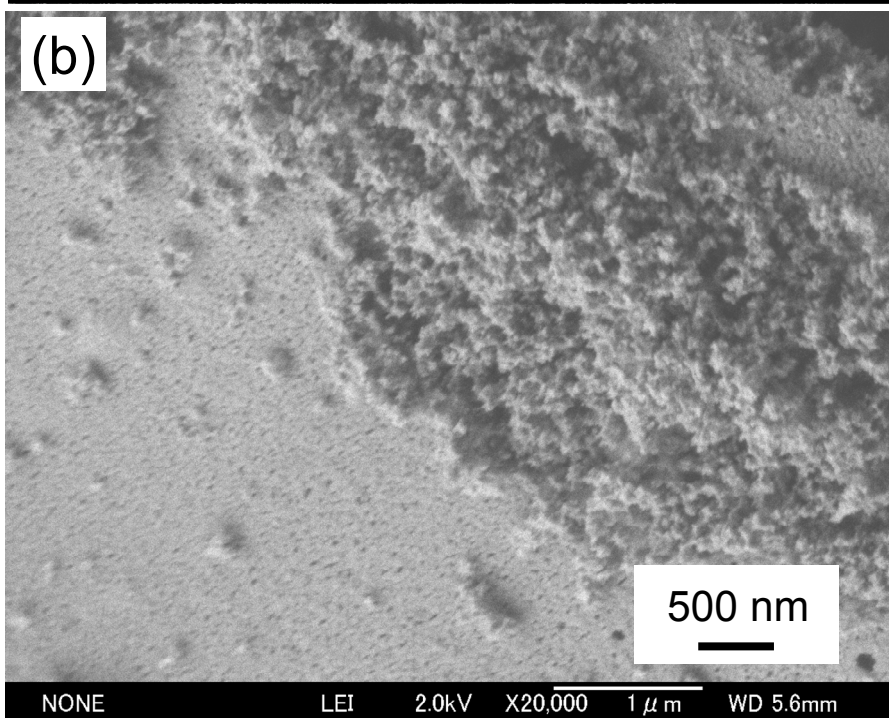
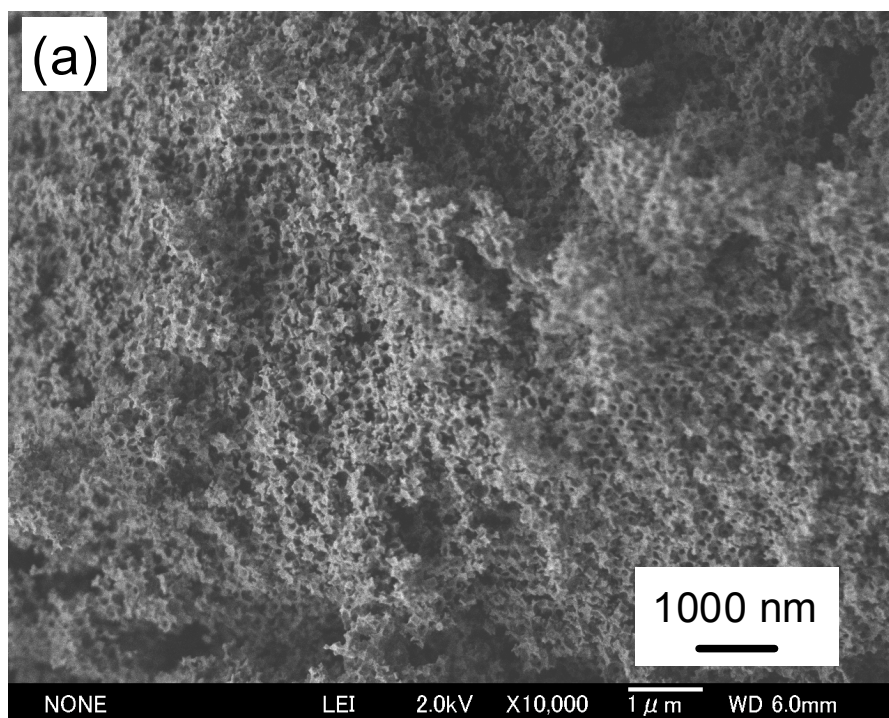
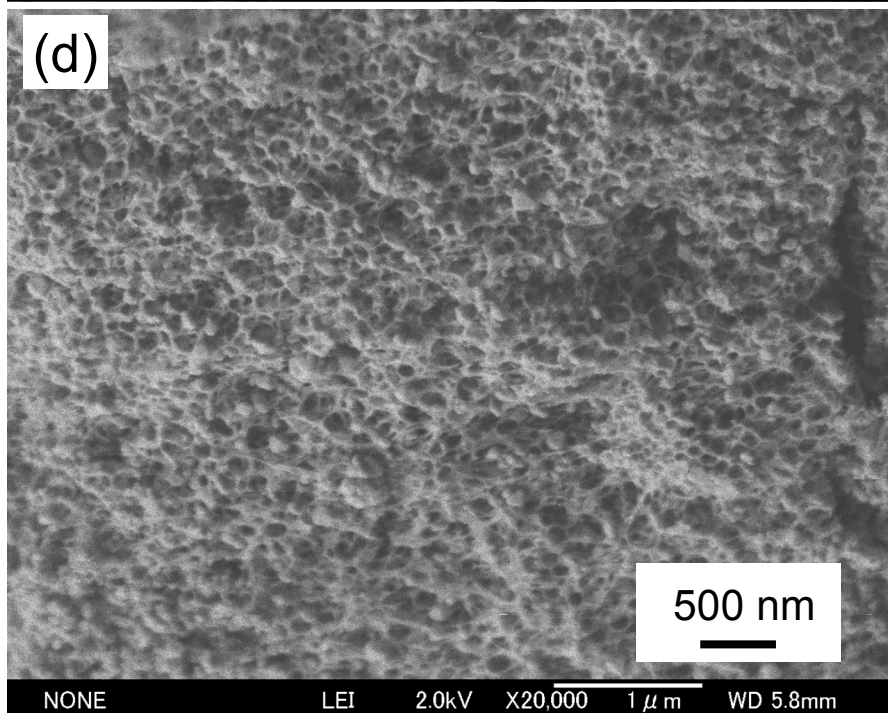
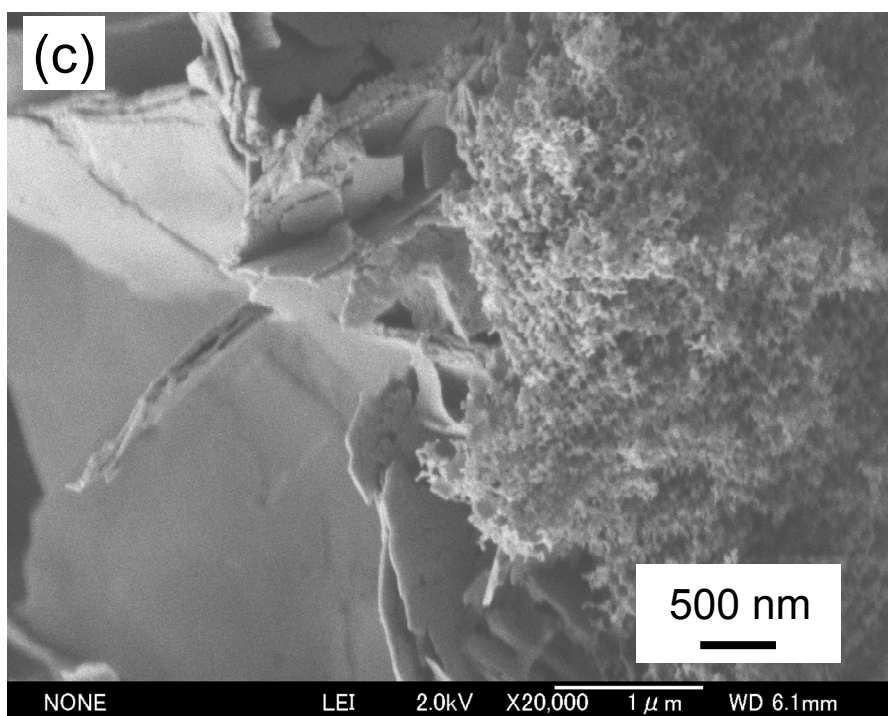


Figure S1. TG-DTA curve of ammonium metatungstate ((NH₄)₆H₂W₁₂O₄₀) (a) and ammonium metatungstate ((NH₄)₆H₂W₁₂O₄₀) infiltrated in the PMMA template (b) in air (heating rate: 10 K min⁻¹)





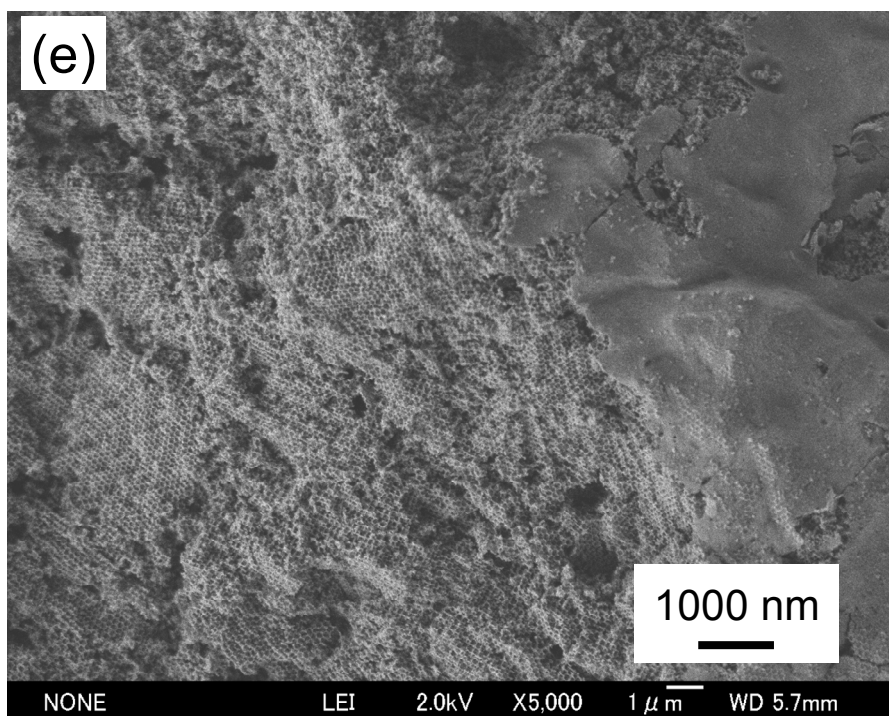


Figure S2. SEM images of not well-ordered 3DOM WO_3 materials prepared using the PMMA colloidal crystal template; tungsten precursor: ammonium metatungstate, (a), tungsten precursor: tungsten(VI) chloride, (b), tungsten precursor: tungsten(V) ethoxide, (c) tungsten precursor: phosphotungstic acid, (d) and (e). PMMA sphere diameter was 253 nm. Calcination temperature was 773 K.

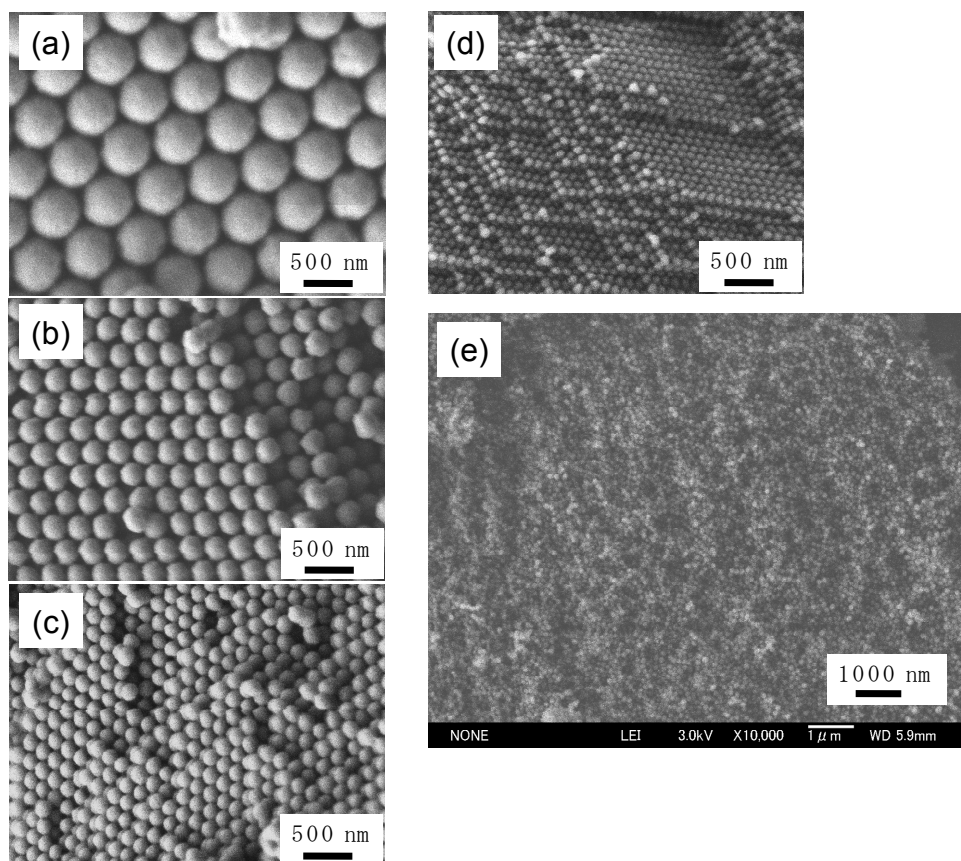


Figure S3. SEM images of PMMA colloidal crystal template. Diameter of PMMA: 492 nm (a), 253 nm (b), 181 nm (c), and 86 nm (d) (e).

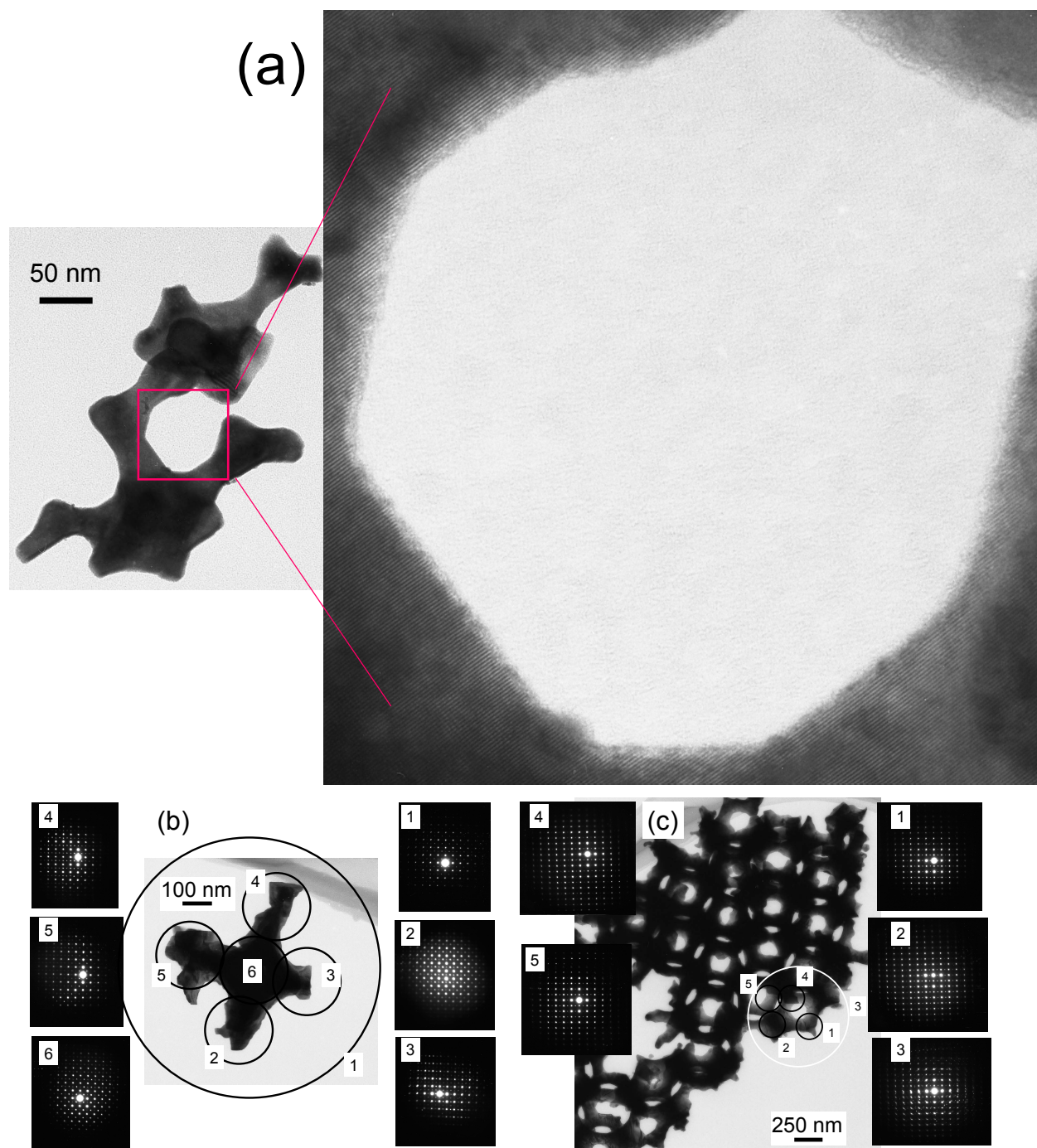


Figure S4. TEM micrograph of 3DOM WO_3 . PMMA diameter: 181 nm; calcination temperature: 773 K (a). TEM micrograph (center) and selected-area ED patterns of WO_3 , PMMA diameter: 253 nm; calcination temperature: 773 K (b), PMMA diameter: 492 nm; calcination temperature: 873 K (c). Zones indicated by circles are selected areas.

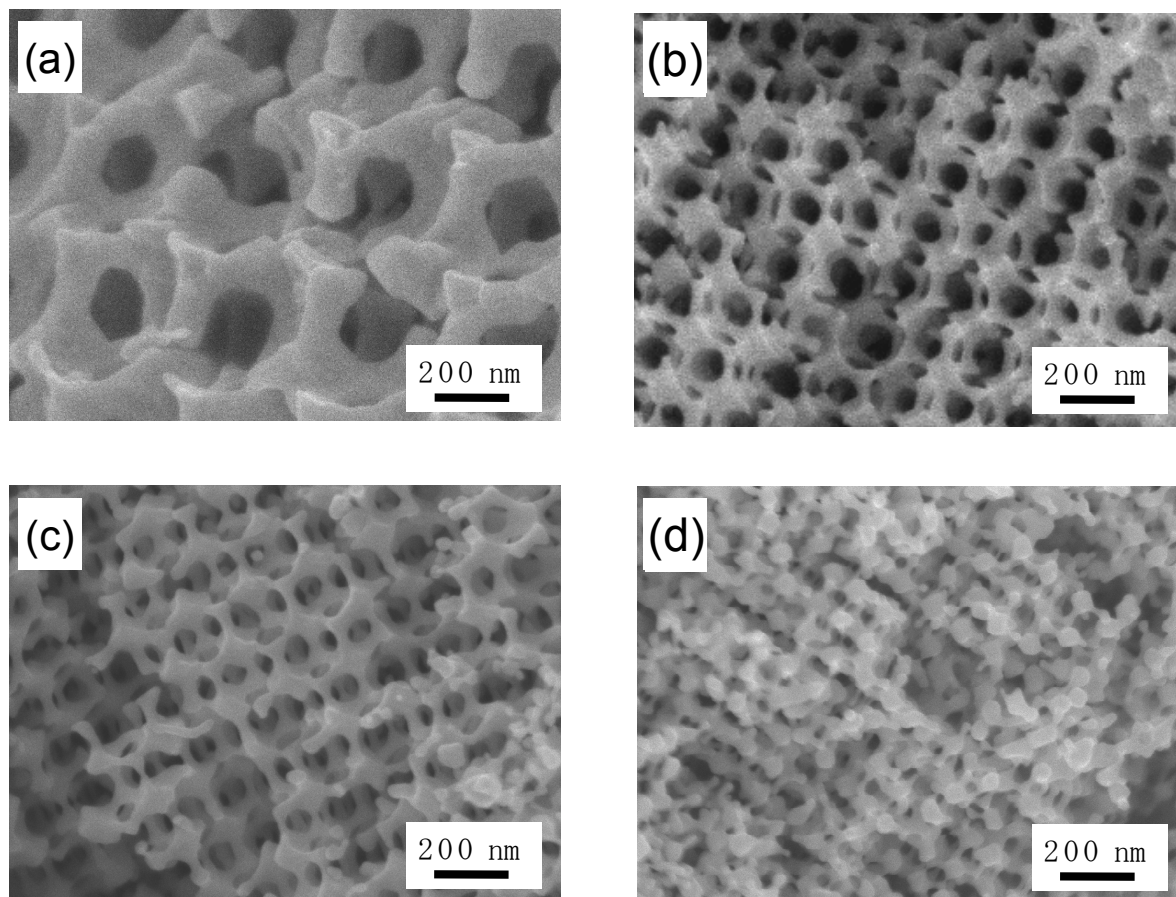


Figure S5. SEM images of WO_3 materials prepared using a colloidal crystal template, PMMA diameter: 492 nm (a), 253 nm (b), 181 nm (c), and 86 nm (d). Calcination temperature was 773 K.

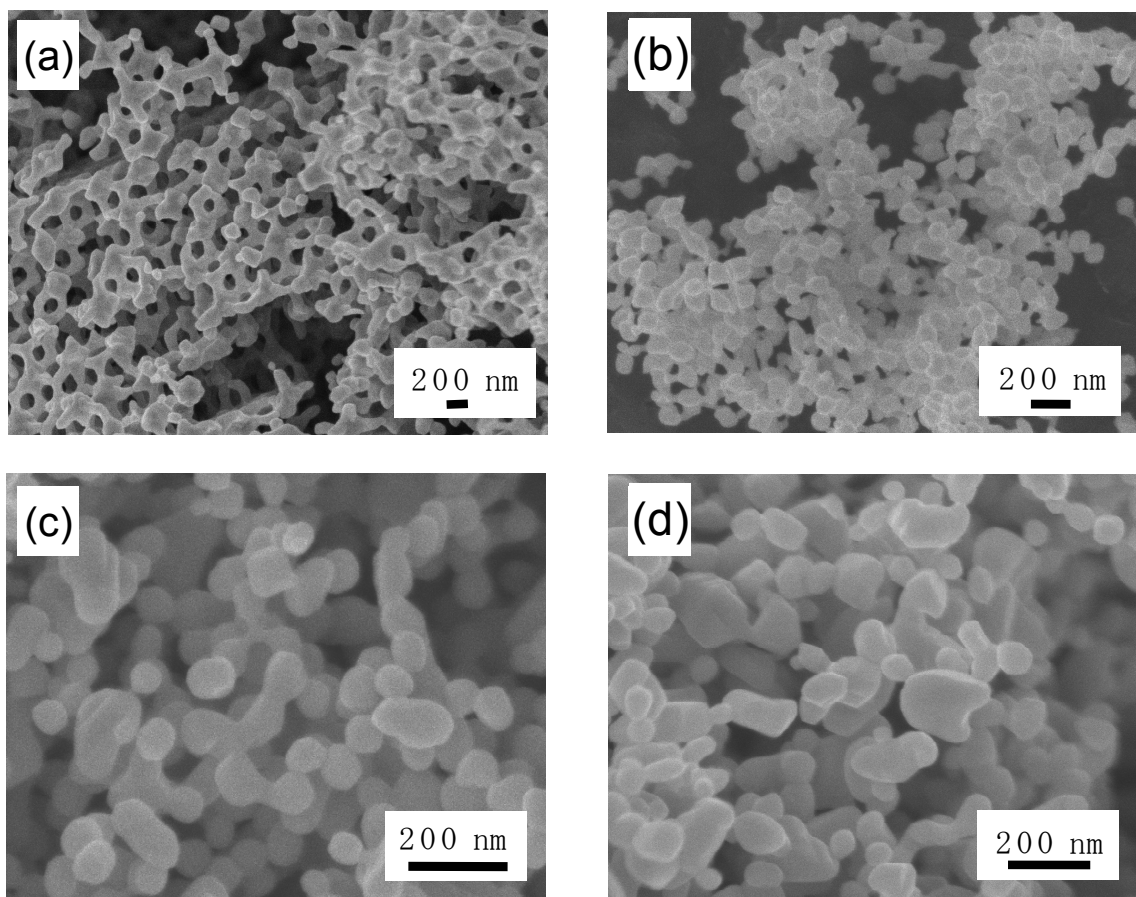


Figure S6. SEM images of WO₃ materials prepared using a colloidal crystal template, PMMA diameter: 492 nm (a), 253 nm (b), 181 nm (c), and 86 nm (d). Calcination temperature was 873 K.

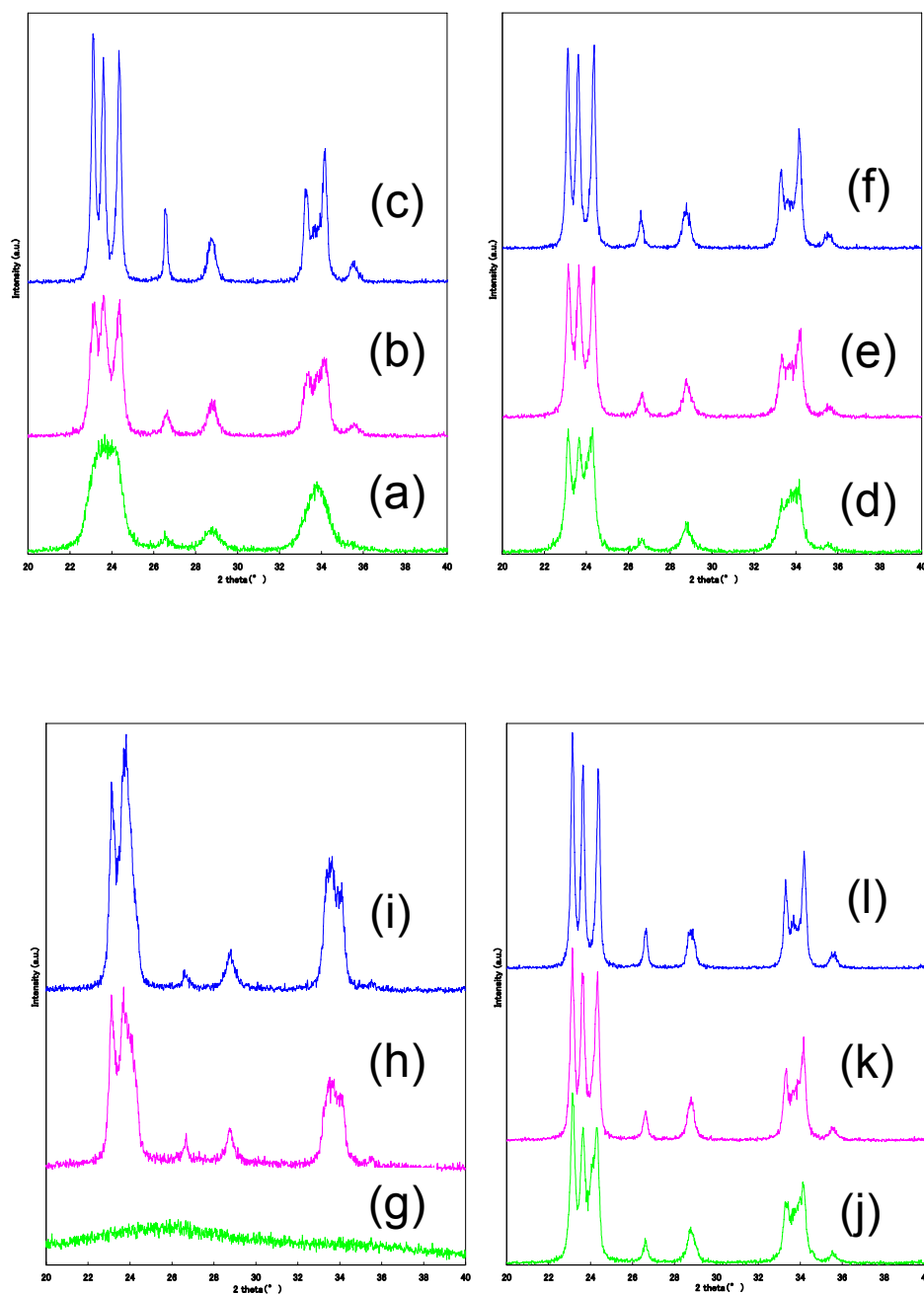
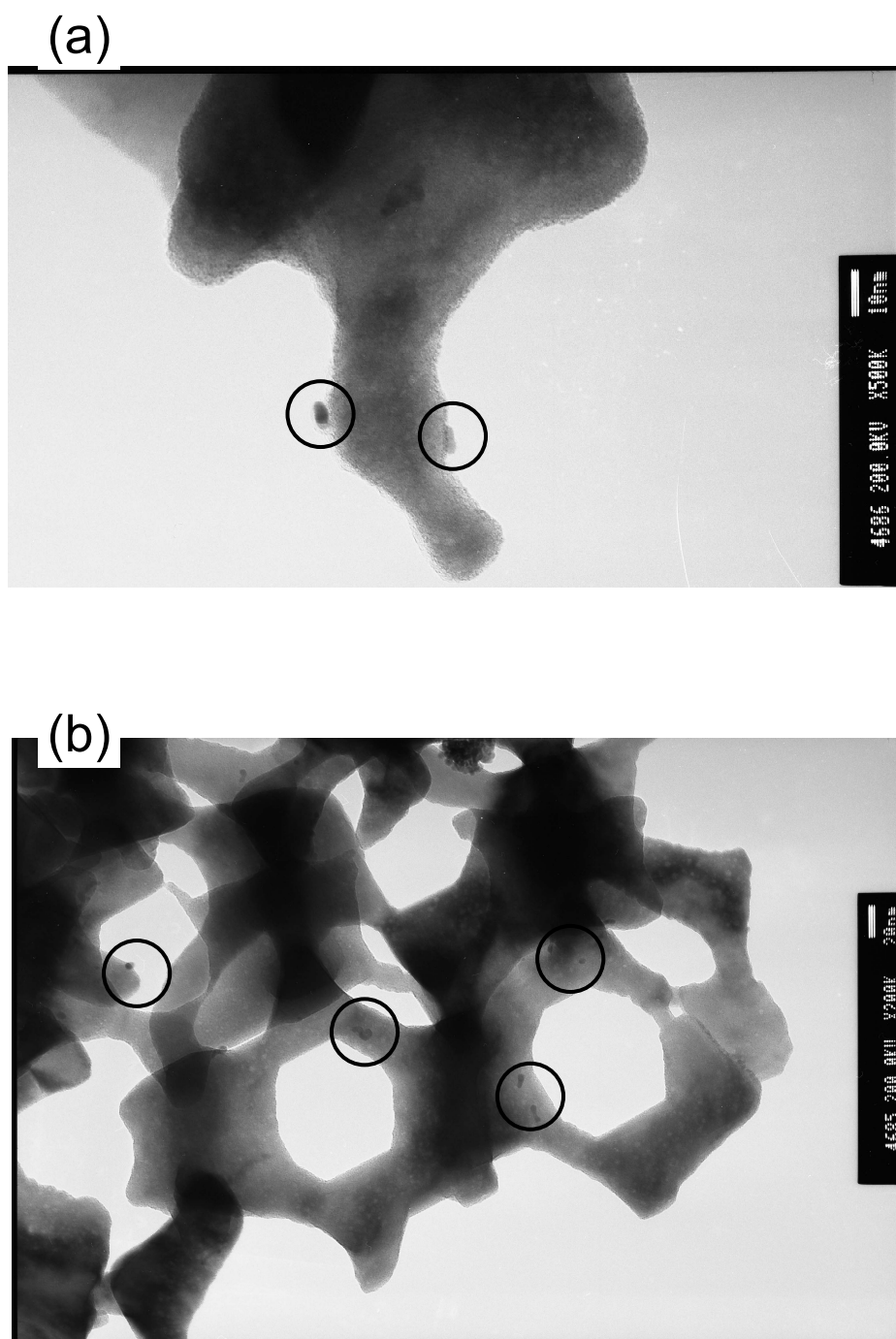


Figure S7. Powder XRD of tungsten oxides prepared using a colloidal crystal template (diameter of PMMA: 253 nm). WCl_6 was used as the tungsten precursor, and calcined at 873 K (a), 773 K (b), and 673 K (c). $\text{W}(\text{OEt})_5$ was used as the tungsten precursor, and calcined at 873 K (d), 773 K (e), and 673 K (f). Phosphotungstic acid ($\text{H}_3\text{PW}_{12}\text{O}_{40}$) was used as the tungsten precursor, and calcined at 873 K (g), 773 K (h), and 673 K (i). Ammonium metatungstate ($(\text{NH}_4)_6\text{H}_2\text{W}_{12}\text{O}_{40}$) was used as the tungsten precursor, and calcined at 873 K (j), 773 K (k), and 673 K (l).



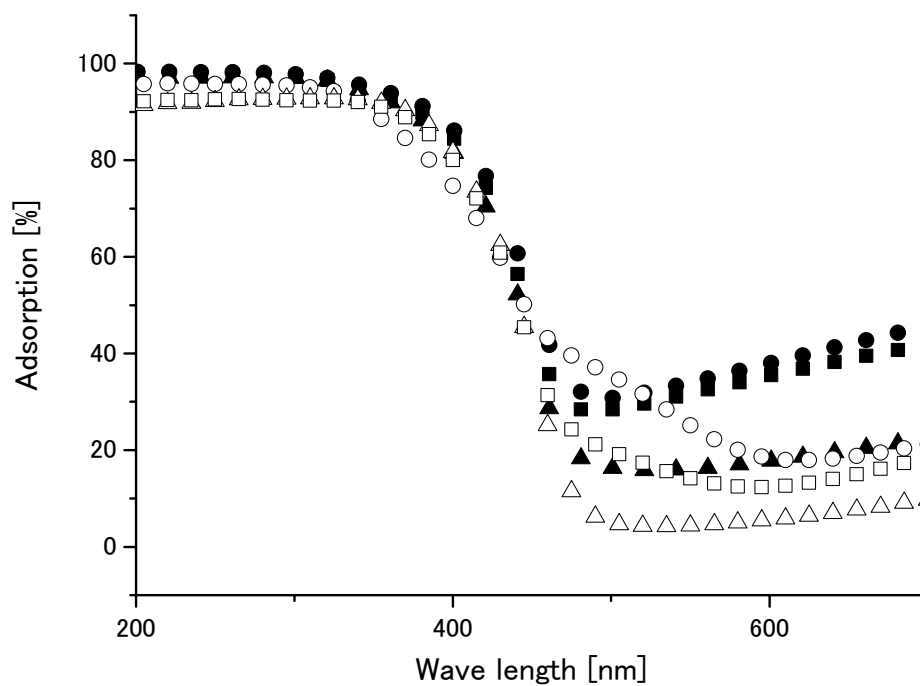


Figure S9. UV-Vis spectra of 3DOM WO₃ prepared using ammonium metatungstate (open symbols) and tungsten chloride (closed symbols) calcined at 673 K (circles), 773 K (squares), and 873 K (triangles).