Electronic Supplementary Material (ESI) for RSC Advances.

Evolution analysis of $V_2O_5 \cdot nH_2O$ gels for preparation of xerogels having a high-specific surface area and their replicas

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SUPPORTING INFORMATION

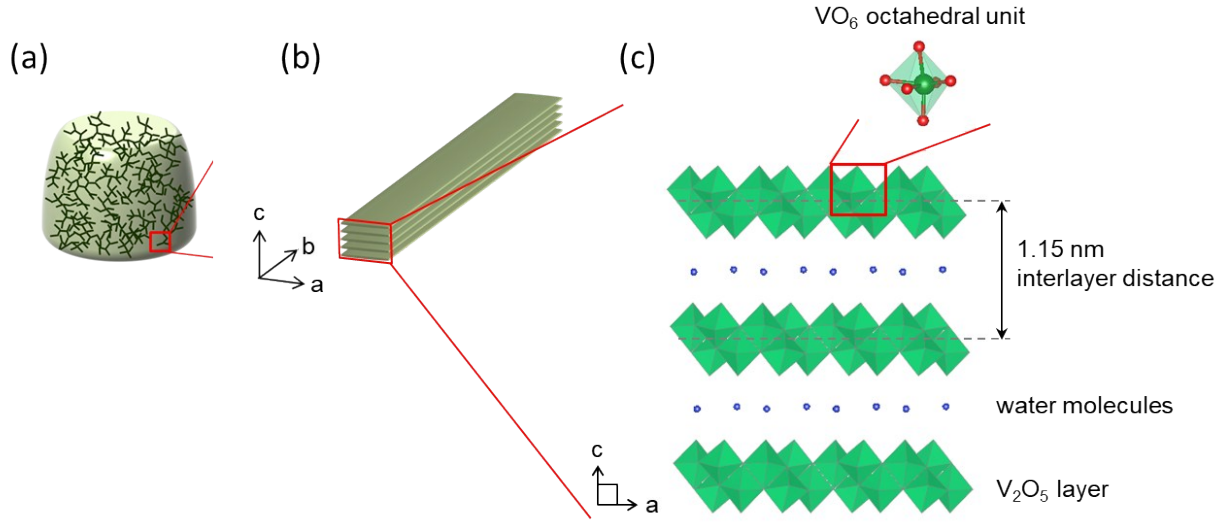

Figure S1. Schematic illustrations of a $V_2O_5 \cdot nH_2O$ gel (a), $V_2O_5 \cdot nH_2O$ nanofiber (b), and crystal structure of $V_2O_5 \cdot nH_2O$ (c).

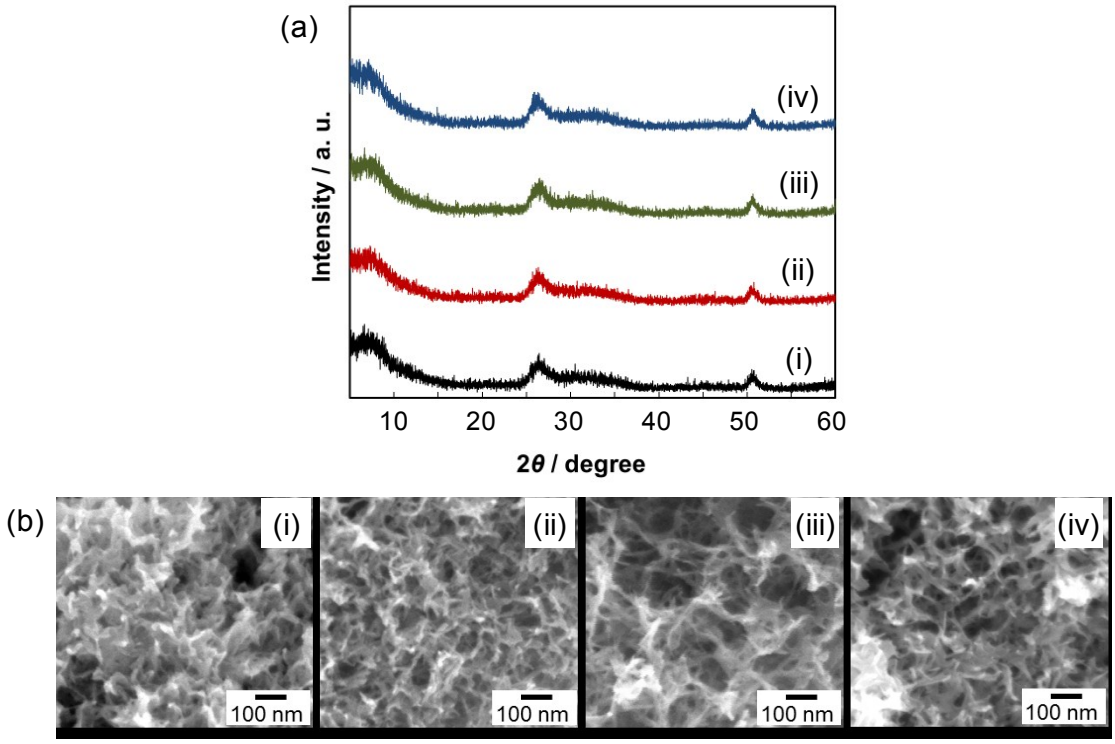

Figure S2. XRD patterns (a) and SEM images (b) of $V_2O_5 \cdot nH_2O$ xerogels ($[VO(OiPr)_3]/[H_2O] = 1/5$) after aging for 24 h (i), 48 h (ii), 96 h (iii), and 192 h (iv).

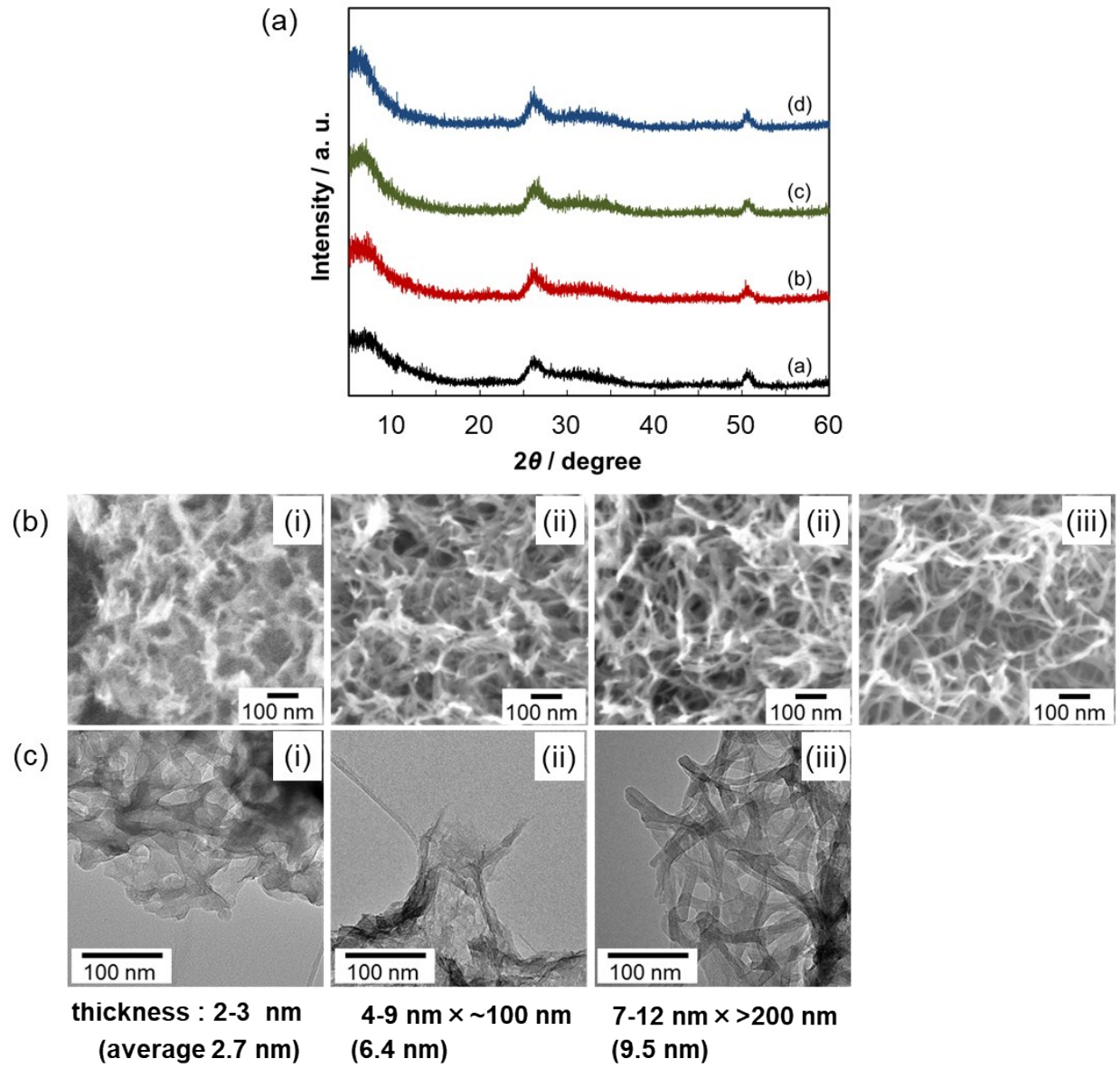

Figure S3. XRD patterns (a) and SEM (b) and TEM (c) images of $V_2O_5 \cdot nH_2O$ xerogels ($[VO(OiPr)_3]/[H_2O]$ = 1/10) after aging for 24 (i), 48 (ii), 96 (iii), and 192 h (iv).

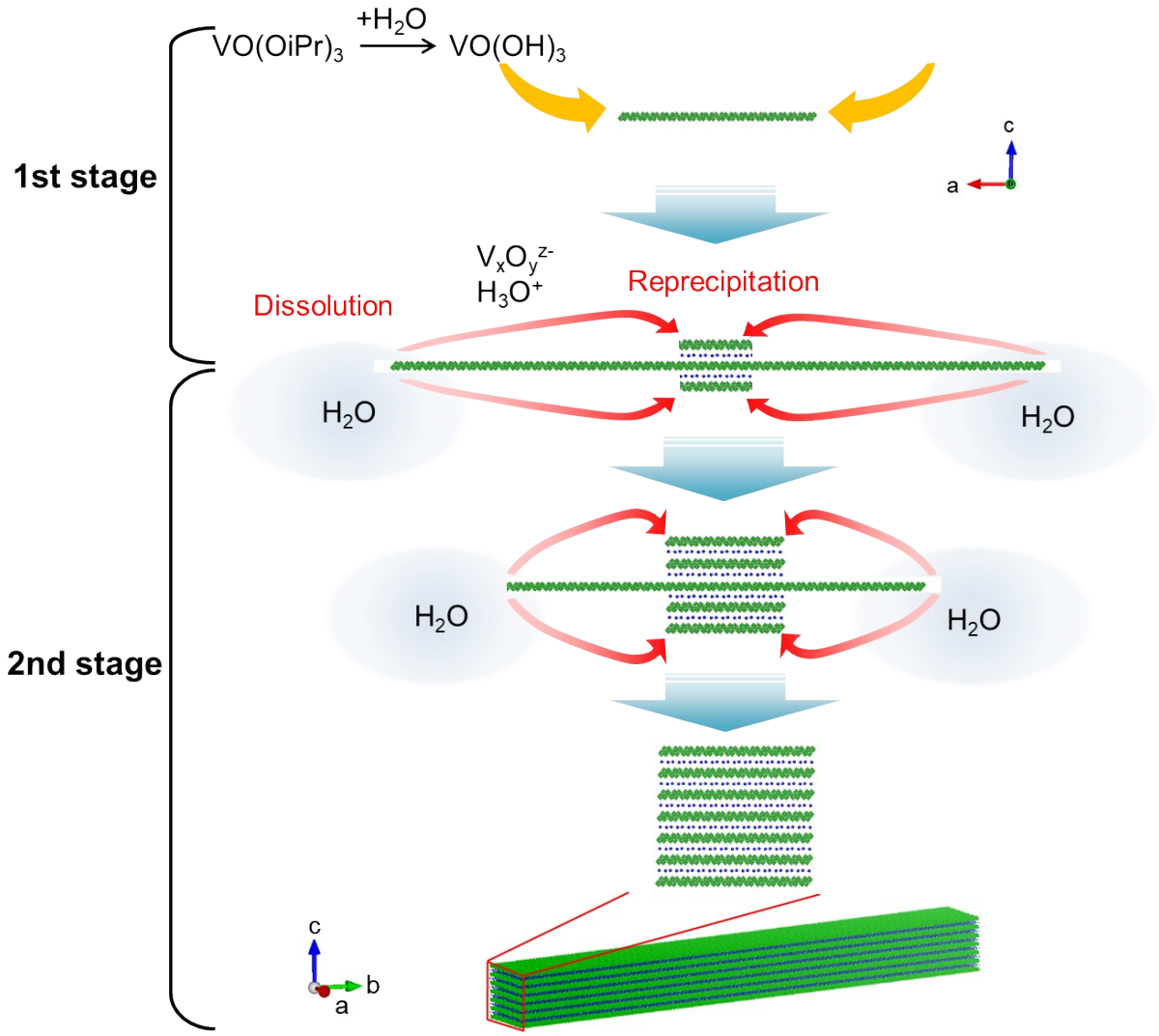

Figure S4. Schematic illustration of the evolution mechanism of ultrathin films and thin fibrils. In the first stage, the V_2O_5 layers expand by deposition of $VO(OH)_3$, which is produced by hydrolysis of $VO(OiPr)_3$, at the edges of the ultrathin films. In the second stage, polyvanadate anions that are supplied by dissolution of the edge of the ultrathin films stack on the V_2O_5 layers with interlayer water.

Table S1. BET surface areas of $V_2O_5 \cdot nH_2O$ xerogels.

Aging [h]	$[VO(OiPr)_3]/[H_2O]$ $[m^2/g]$		
	1/40	1/10	1/5
0.5	191		
2	320		
24	207	258	278
48	205	240	162
96	262	289	292
192		272	255

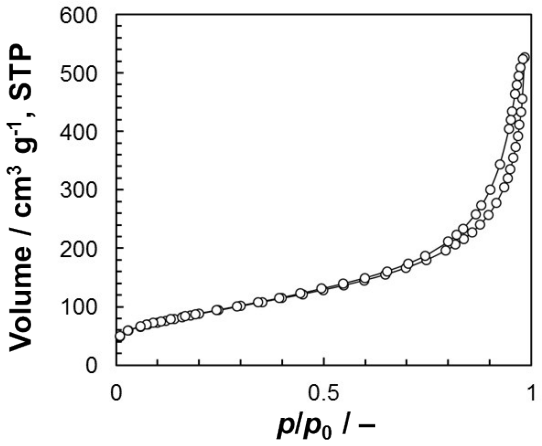

Figure S5. N_2 adsorption/desorption isotherms of $V_2O_5 \cdot nH_2O$ xerogels ($[VO(OiPr)]/[H_2O]$ = 1/40) after aging for 2.0 h.

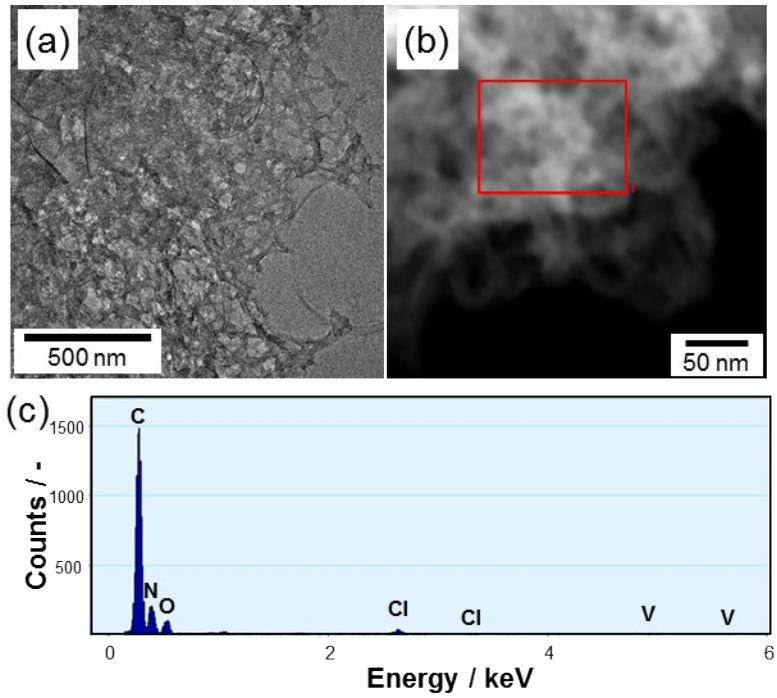

Figure S6. TEM (a) and HAADF-STEM (High-Angle Annular Dark Field Scanning TEM) (b) images and EDX spectrum (c) of PPy replicas of $V_2O_5 \cdot nH_2O$ xerogels. The measured area is displayed with red square in the HAADF-STEM image.

Preparation procedure of chemical polymerization of polypyrrole

Anhydrous ferric chloride ($FeCl_3$) as an oxidant, pyrrole, and water as a solvent were used in this experiment. Pyrrole was added to the aqueous solution of $FeCl_3$ and kept at room temperature with stirring for 24 h. The concentration of pyrrole varied from 18-72 mmol dm^{-3} and the molar ratio of [pyrrole]/[$FeCl_3$] was fixed at 1/4. The reaction product was filtered and washed thoroughly with HCl_{aq} and dried at 60 C at ambient pressure.