Electronic Supplementary Material (ESI) for Soft Matter.

Supplementary Information

Biomimetic synthesis of single crystalline anhydrous xanthine nanoplates in aqueous solution with high reflectivity

Xiubin Hou,[a] Yingxia Wang,[b] Xinbing Song,*[c] Juan Gao,[a] Yurong Ma*[a]

[a] *MOE Key laboratory of Cluster Science, Key Laboratory of Medical Molecule Science and Pharmaceutical Engineering, School of Chemistry and Chemical Engineering, Beijing Institute of Technology, Beijing, 100081, China. E-mail: yurong.ma@bit.edu.cn*

[b] *College of Chemistry and Molecular Engineering. Peking University, Beijing, 100871, China.*

[c] *School of Physics, Beijing Institute of Technology, Beijing, 100081, China. E-mail: songxinbing@bit.edu.cn*

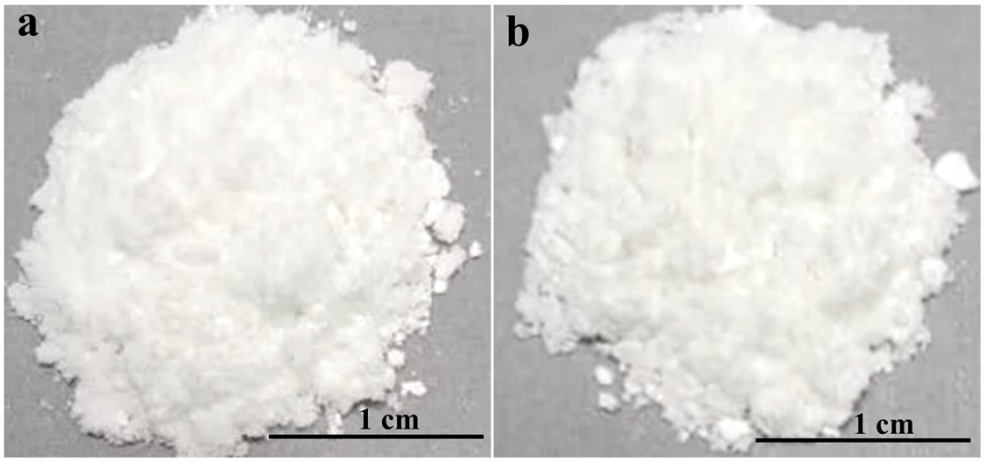

Figure S1. Optical photographs of dried powders of (a) rhomboidal anhydrous xanthine nanoplates and (b) triangular anhydrous xanthine nanoplates.

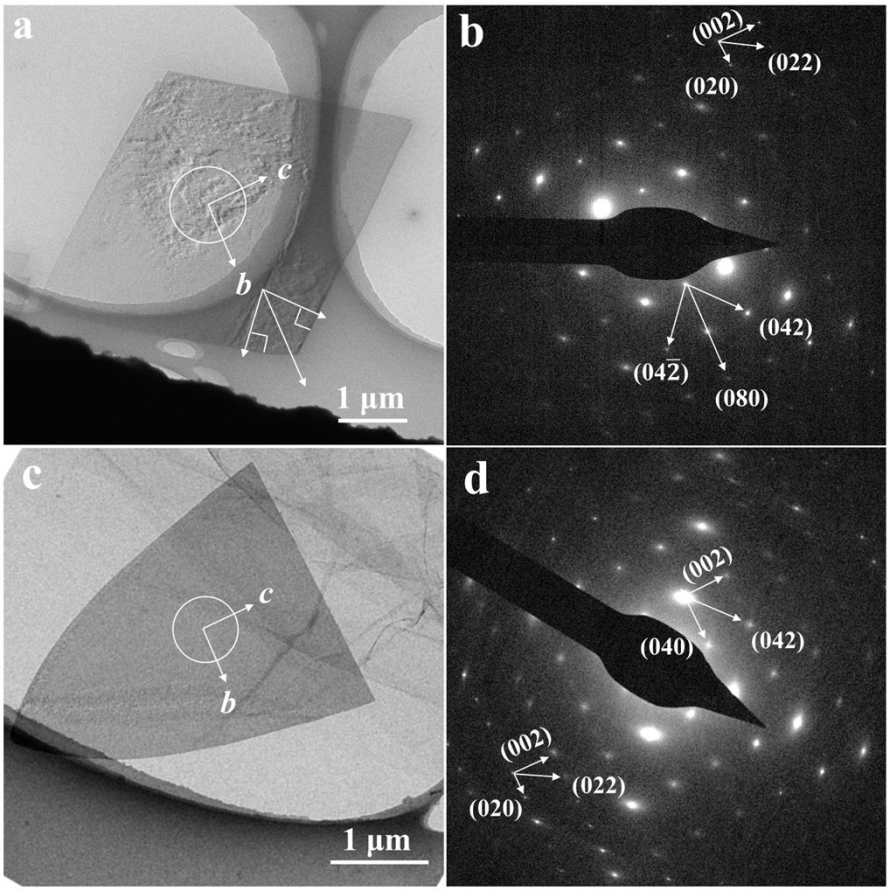

Figure S2. TEM images and SAED patterns of (a and b) rhomboidal anhydrous xanthine nanoplates and (c and d) triangular anhydrous xanthine nanoplates.

Figure S3. Optical photographs of (a) rhomboidal anhydrous xanthine nanoplates and (b) triangular anhydrous xanthine nanoplates dispersed in aqueous solution.

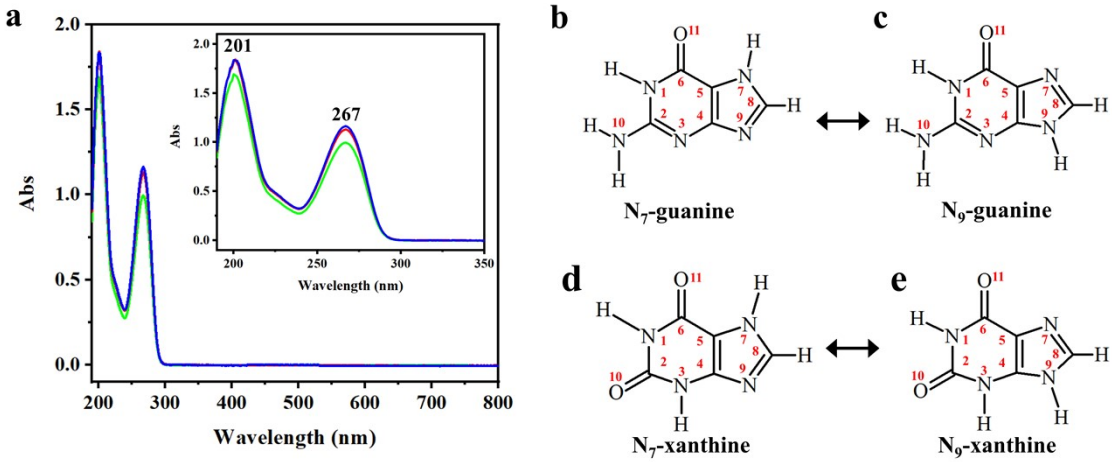

Figure S4. (a) UV-vis spectra of (blue line) rhomboidal anhydrous xanthine nanoplates, (red line) triangular anhydrous xanthine nanoplates and (green line) commercial xanthine. Structures of two tautomers of guanine and xanthine. (b) N_7-guanine, (c) N_9-guanine, (d) N_7-xanthine and (e) N_9-xanthine.

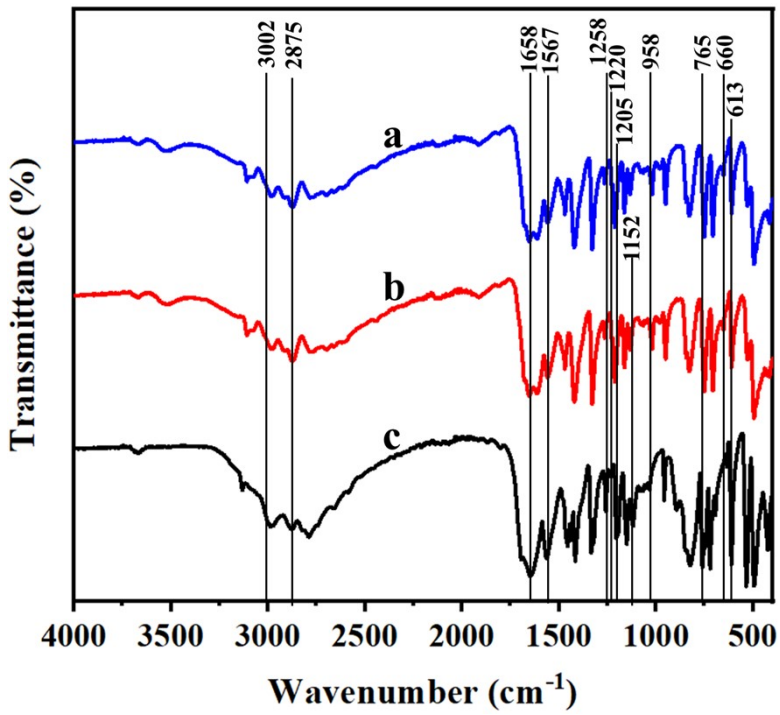

Figure S5. FT-IR spectra of dried xanthine samples. (a) Rhomboidal anhydrous xanthine nanoplates, (b) triangular anhydrous xanthine nanoplates and (c) commercial xanthine.

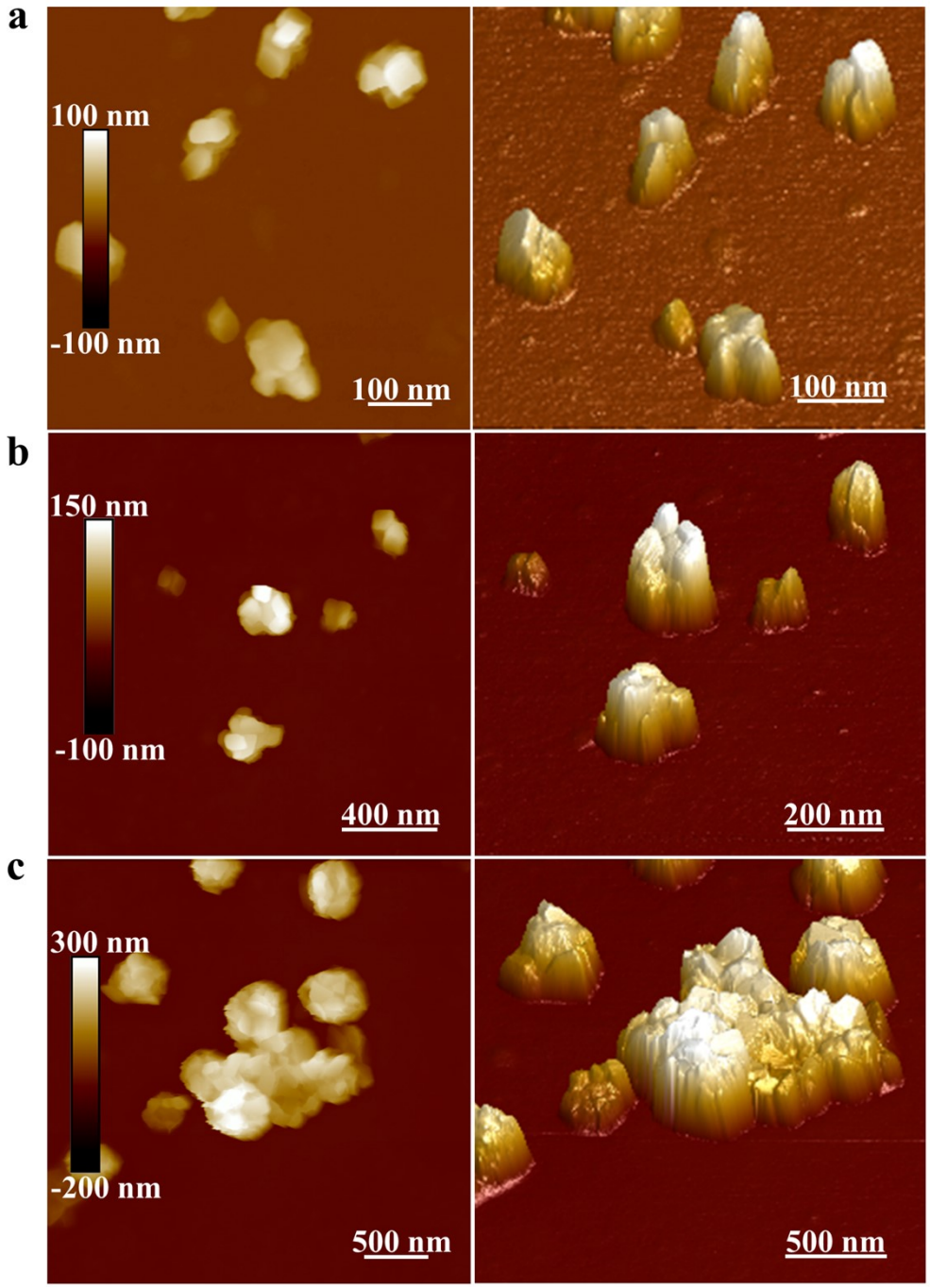

Figure S6. AFM of xanthine products obtained in the solution in the presence of 1 mg mL^{-1} of P(VP-*co*-VA) after (a) 0.5 h, (b) 1 h and (c) 3 h. The images in the left column are the AFM images and the diagrams in the right column are 3D images of AFM images in the left column.

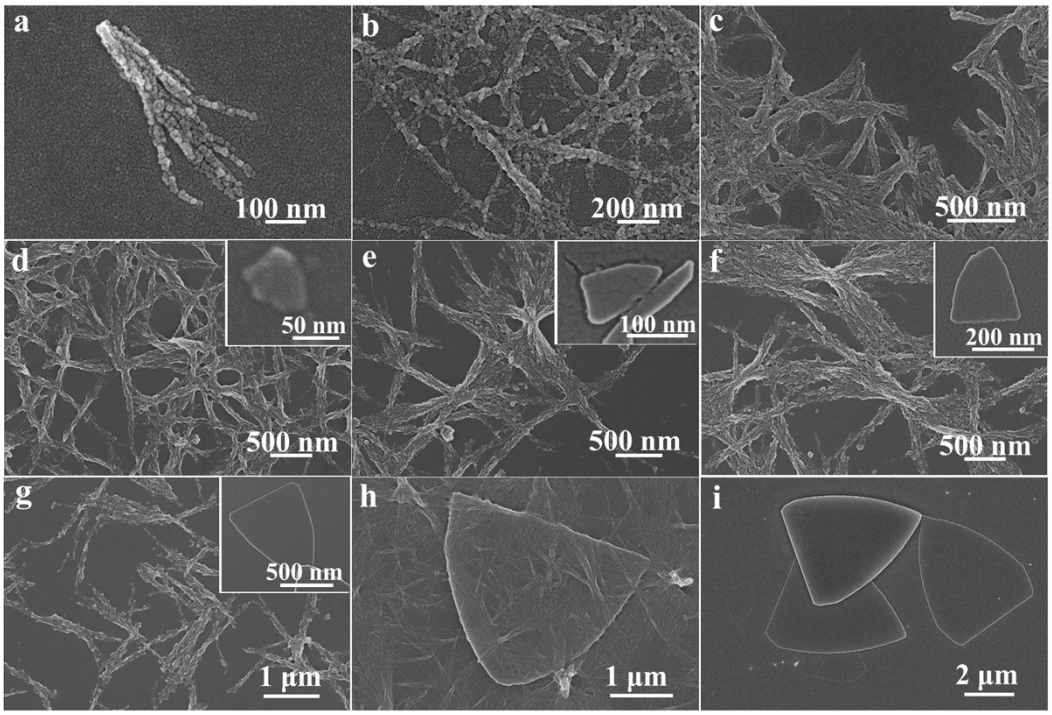

Figure S7. SEM images of xanthine products obtained in the solution in the absence of polymer additive after different reaction times under otherwise standard conditions: (a) 0.5 h, (b) 1 h, (c) 2 h, (d) 2.5 h, (e) 2.75 h, (f) 3 h, (g) 3.17 h, (h) 3.5 h, (i) 4 h.

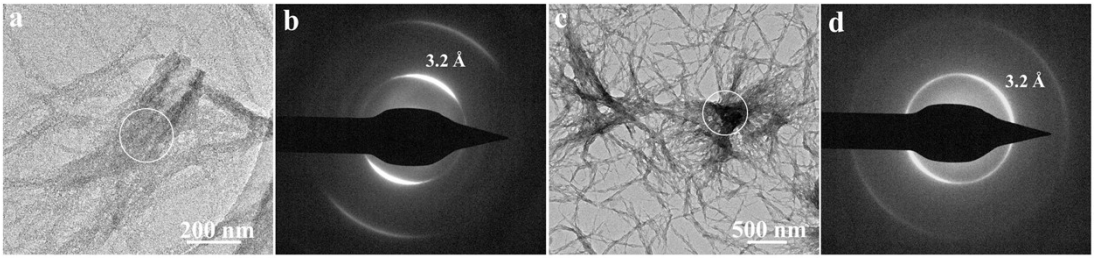

Figure S8. TEM images and SAED patterns of xanthine products obtained in the solution in the absence of polymer additive after different reaction times under otherwise standard conditions: (a and b) 2 h, (c and d) 3 h.

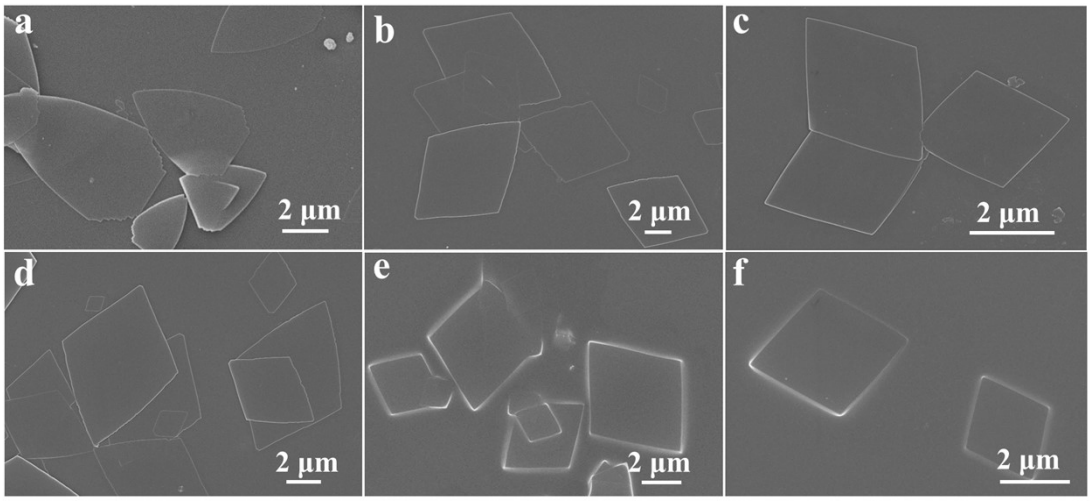

Figure S9. SEM images of xanthine crystals synthesized under different concentrations of P(VP-*co*-VA) in the reaction solution under otherwise standard conditions: (a) 0.001 mg mL^{-1}, (b) 0.005 mg mL^{-1}, (c) 0.01 mg mL^{-1}, (d) 5 mg mL^{-1}, (e) 8 mg mL^{-1}, (f) 10 mg mL^{-1}.

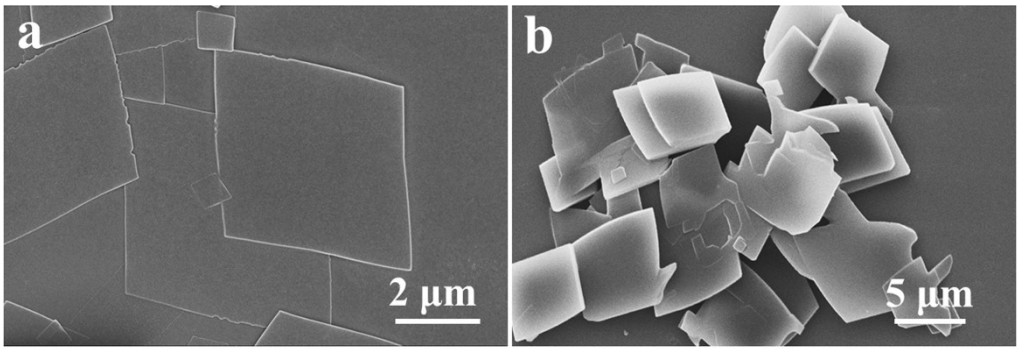

Figure S10. SEM images of xanthine crystals synthesized under different concentration of xanthine in the reaction solution under otherwise standard conditions: (a) 0.015 mol L^{-1}, (b) 0.02 mol L^{-1}. There were no products in the reaction solution under otherwise standard condition in the presence of 0.005 mol L^{-1} of xanthine.

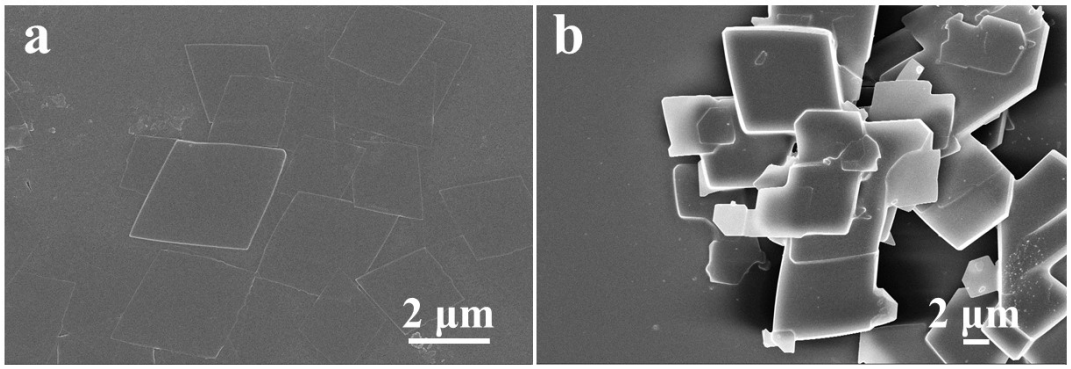

Figure S11. SEM images of xanthine crystals synthesized under different reaction temperatures and times under otherwise standard conditions. The products were obtained at (a) 25 °C by stirring for 10 h and (b) 45 °C by stirring for 5 h, respectively.

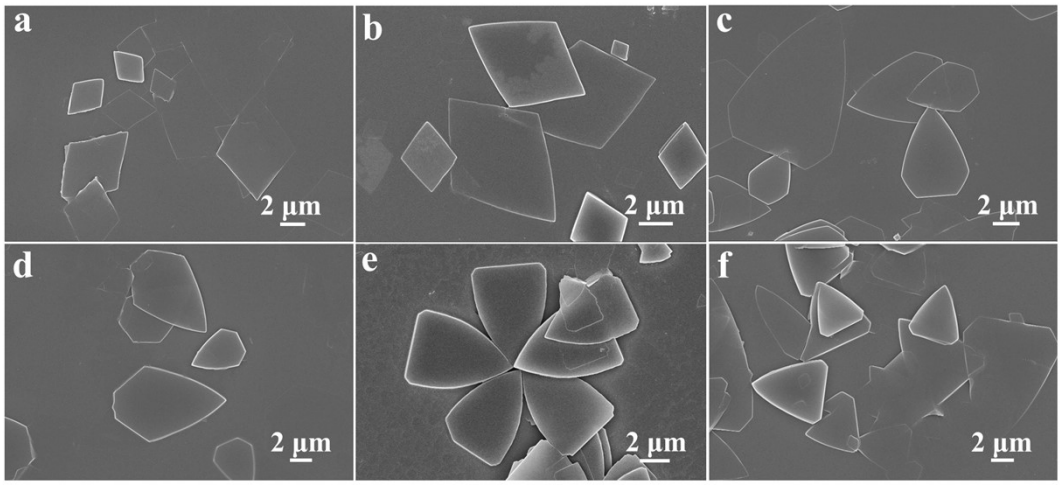

Figure S12. SEM images of xanthine crystals synthesized in ammonia solution in the presence of different polymer additives with the concentration of 1 mg mL^{-1} under otherwise standard conditions: (a) Soluplus, (b) polyquaternium-10, (c) PNVCL, (d) PVP K30, (e) P(AAM-*co*-DADMAC), (f) P(VP-*co*-DM).

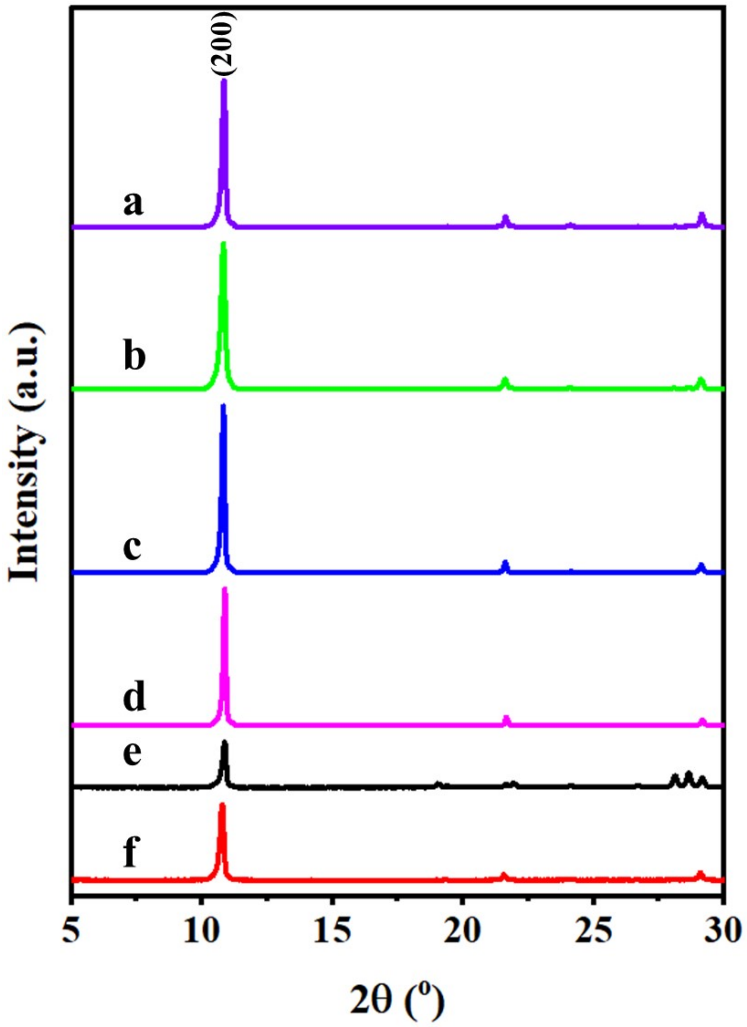

Figure S13 PXRD patterns of xanthine crystals synthesized in ammonia solution in the presence of different polymer additives with the concentration of 1 mg mL^{-1} under otherwise standard conditions: (a) Soluplus, (b) polyquaternium-10, (c) PNVCL, (d) PVP K30, (e) P(AAM-*co*-DADMAC), (f) P(VP-*co*-DM).

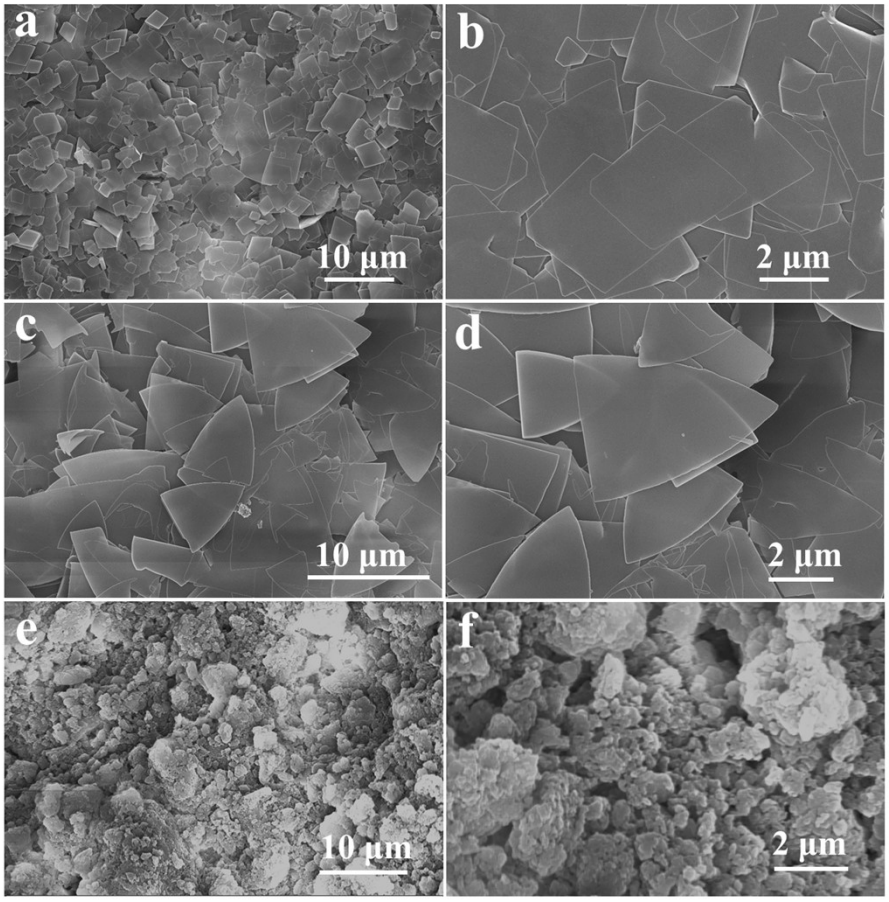

Figure S14. SEM images of (a and b) rhomboidal anhydrous xanthine nanoplates, (c and d) triangular anhydrous xanthine nanoplates, (e and f) commercial xanthine for diffuse reflection tests.

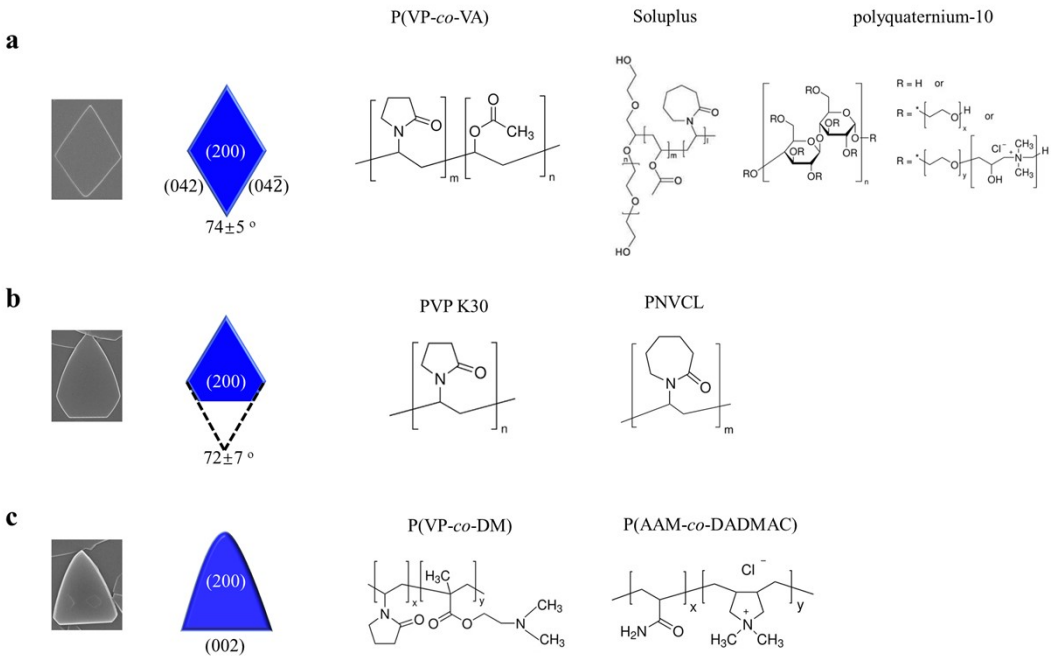

Figure S15. Schematic diagrams of xanthine crystals with different morphologies and the molecular structural formulas of polymers added to reaction solution for synthesizing xanthine crystals with this morphology. (a) Rhomboidal xanthine nanoplates, (b) misshaped triangular nanoplates with a few side planes and (c) triangular xanthine nanoplates.