Supporting Information

Acetic Acid-confined Synthesis of Uniform Three-dimensional (3D) Bismuth Telluride Nanocrystals Consisted of Few-quintuple Layer Nanoplatelets

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Experimental section:

Chemicals: Sodium Tellurite (99%), Bismuth (III) nitrate pentahydrate (99.99%), Poly(vinylpyrrolidone) (PVP; PT40, MW = 40,000), Ethylene glycol (99%), hydrazine monohydrate (N_2H_4, 64-65%), Formic acid (88%), Acetic acid (99.7%), Propionic acid (99.5%), Ethanol (99.99%) and Acetone (99.9%) were purchased from Sigma-Aldrich. Chemicals were used as received without further purification.

Characterizations: The TEM and SEM images of the samples were examined with FEI Tecnai T12 (120 KV) and FEI Magellan TEGSEM. HRTEM, X-Ray energy spectrometer (EDS), High-angle annular dark field scanning TEM (HAADF-STEM) and element mapping were obtained with FEI Titan 80 (300 KV). X-ray diffraction (XRD) patterns of the samples were recorded on a Bruker D8 Advance diffractometer with Cu K_α radiation (λ=1.5418 Å) with graphite monochromator (40 KV, 40 mA). Atomic force microscopy (AFM) images were tested on Agilent 5500 ILM AFM. Raman spectra of the individual flower-like monocrystal were obtained with LabRAM ARAMIS with excitation laser wavelength λ = 473 nm.

Synthesis of flower-like Bi_2Te_3 nanocrystals: A total of 1.5 mL of $NaTeO_3$ (0.1 M) Ethylene glycol (EG) solution, 1.0 mL of $Bi(NO_3)_3$ (0.1 M) EG solution, 0.5 g of PVP, 0.6 mL of acetic acid and 0.25 mL of hydrazine monohydrate were added to 22.5 mL of EG and stirred for 5 min. The resulting homogeneous solution was transferred to a 45 mL Teflon-lined stainless-steel autoclave. The sealed vessel was then heated at140℃ for 1.0 h before it was cooled to room temperature. The product was separated via centrifugation by adding 20 mL of acetone at 12 000 rpm for 1.0 h. The product was washed several times with the mixture of acetone and ethanol to remove any residual. The final product was dispersed in ethanol.

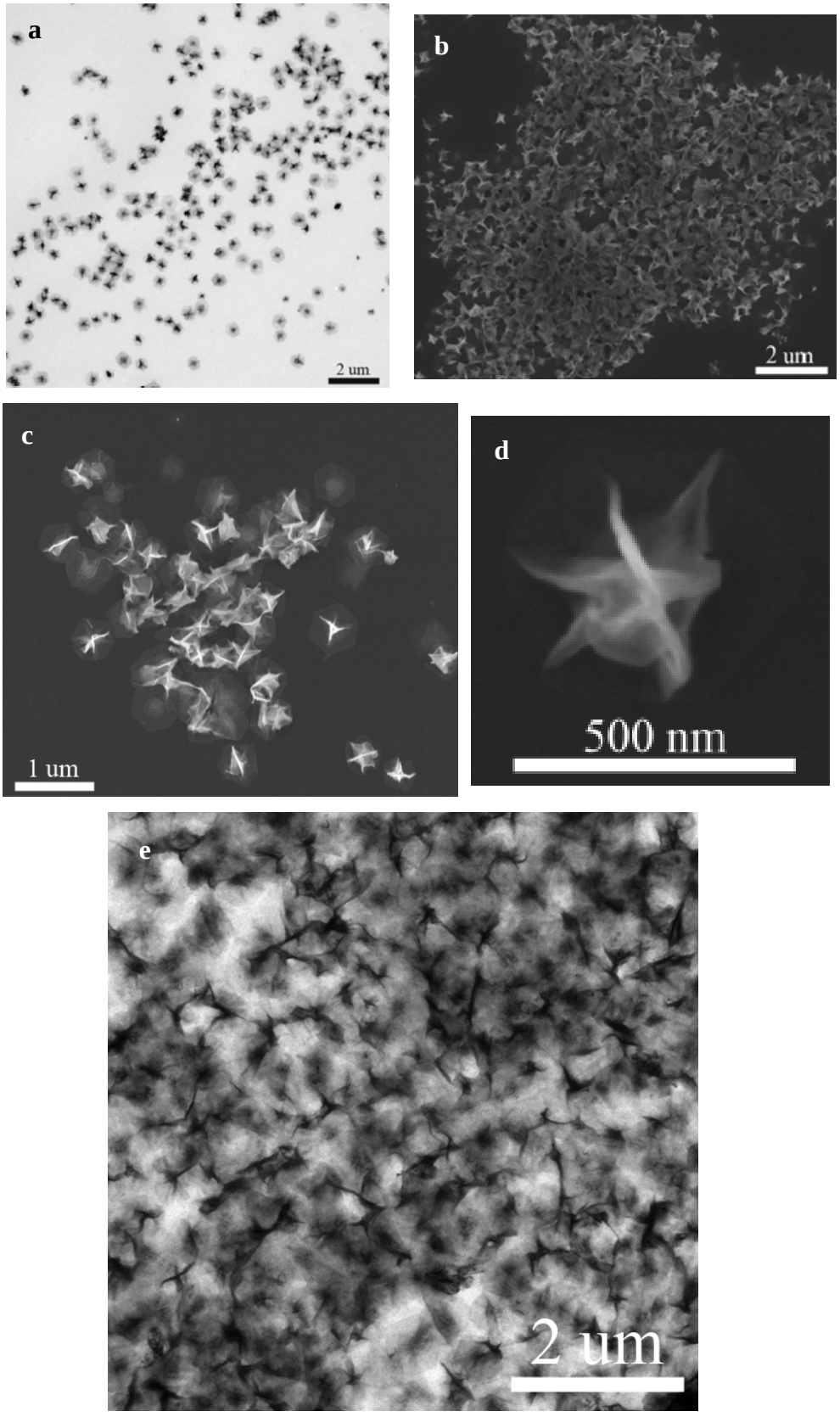

Fig. S1. TEM (a) and SEM (b-d) images and TEM image of self-assembled types (e) (2D film) of as-synthesized Bi_2Te_3 nanocrystals.

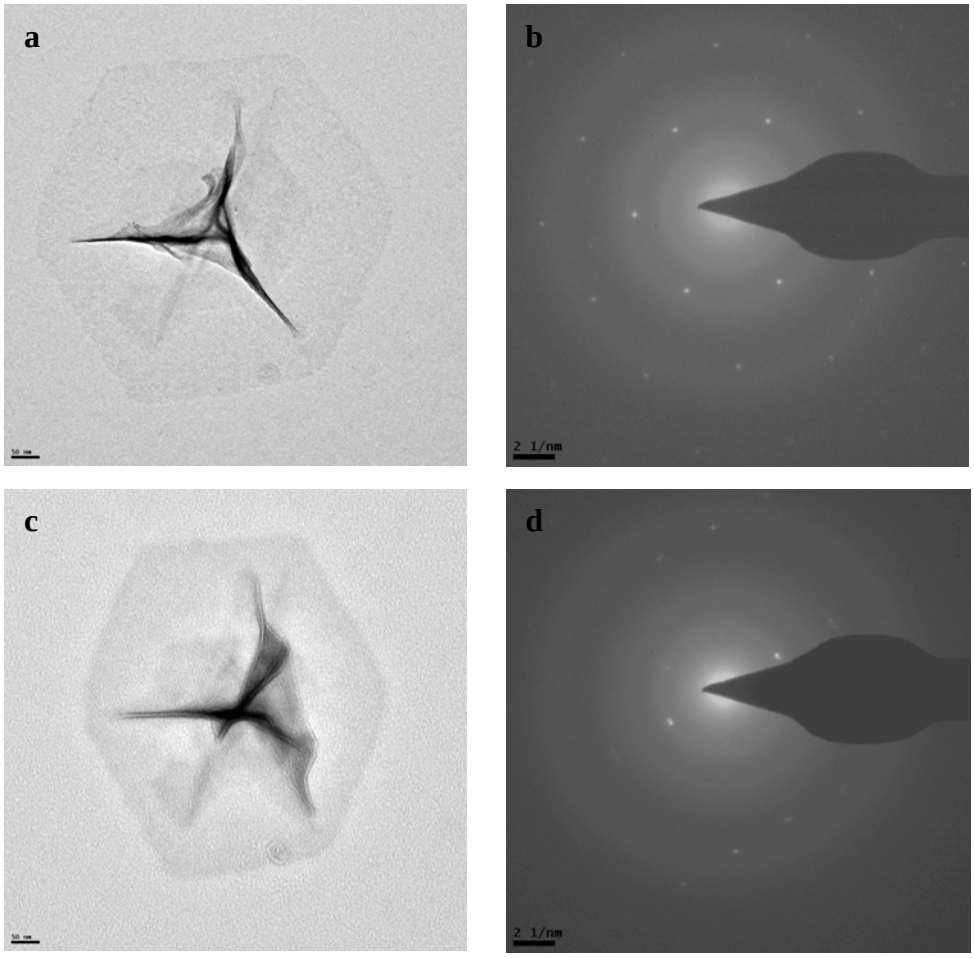

Fig. S2. The TEM image and corresponding electron diffraction (ED) pattern of an individual flower-like Bi_2Te_3 nanocrysyal at different tilt angle. (a-b) 0^o; (c-d) 30^o

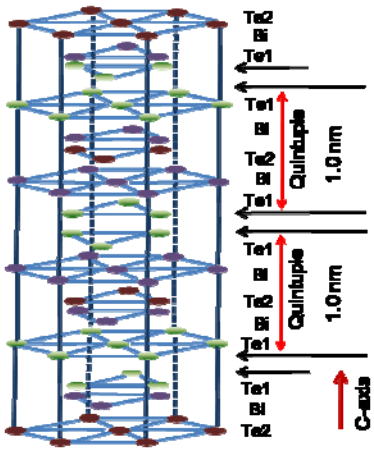

Fig. S3. Schematic diagram of Bi_2Te_3 crystal structure of D^5_{3d} (R-3m) space group.

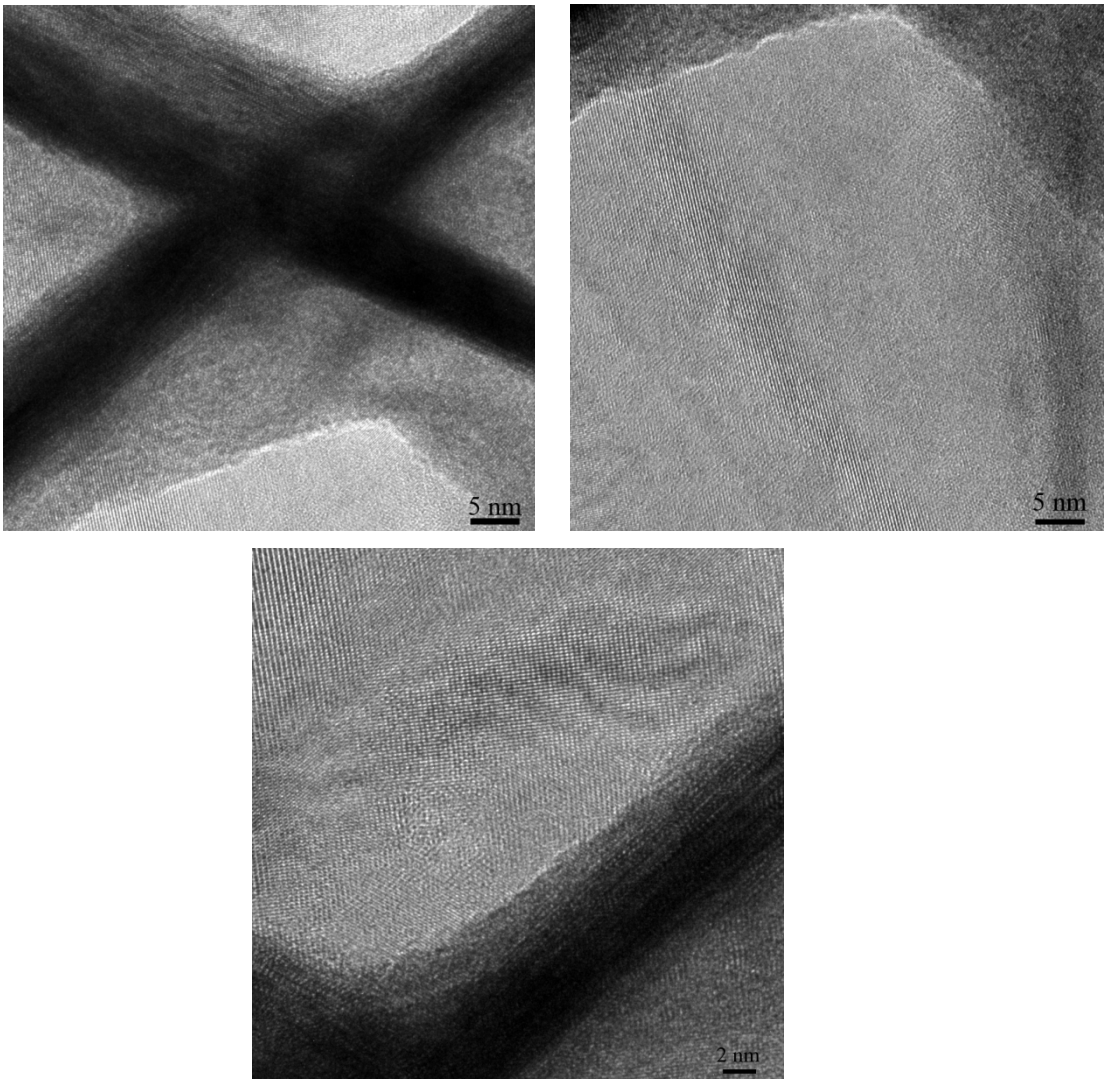

Fig. S4. HRTEM images of flower-like Bi_2Te_3 nanocrystal taken from different areas.

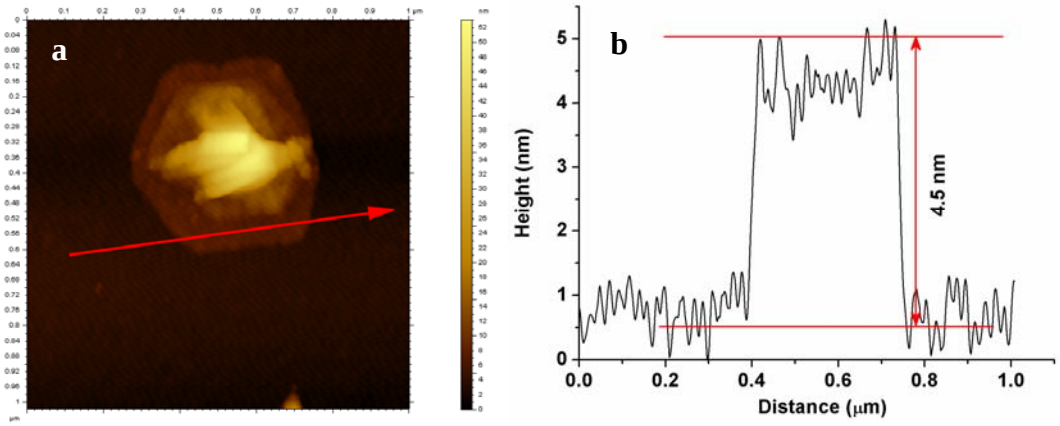

Fig. S5. AFM image of Bi_2Te_3 nanocystal (a) and (b) the section profiles along the red lines shown in (a).

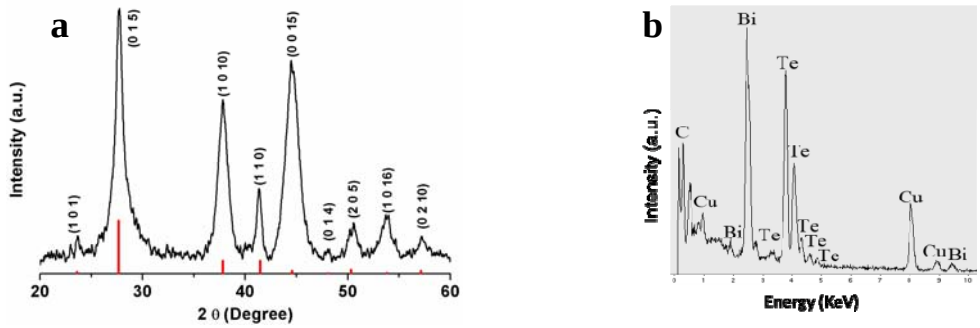

Fig. S6. XRD patterns of as-synthesized Bi_2Te_3 nanocrystals (a) and EDS spectra (b).

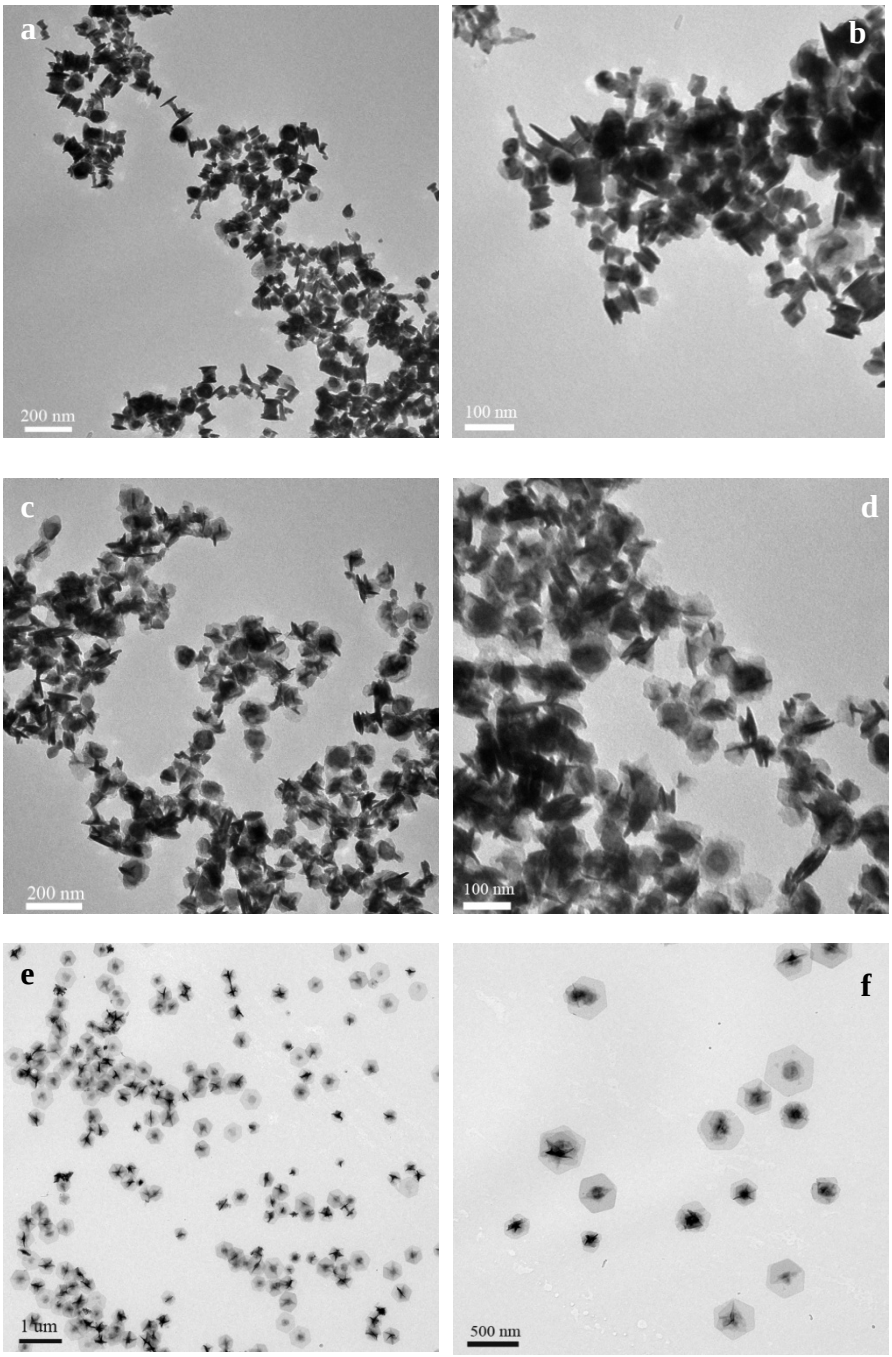

Fig. S7. TEM images of samples prepared with the different amount of acetic acid. (a-b) In the absence of acetic acid; (c-d) 0.2 mL; (e-f) 0.4 mL.

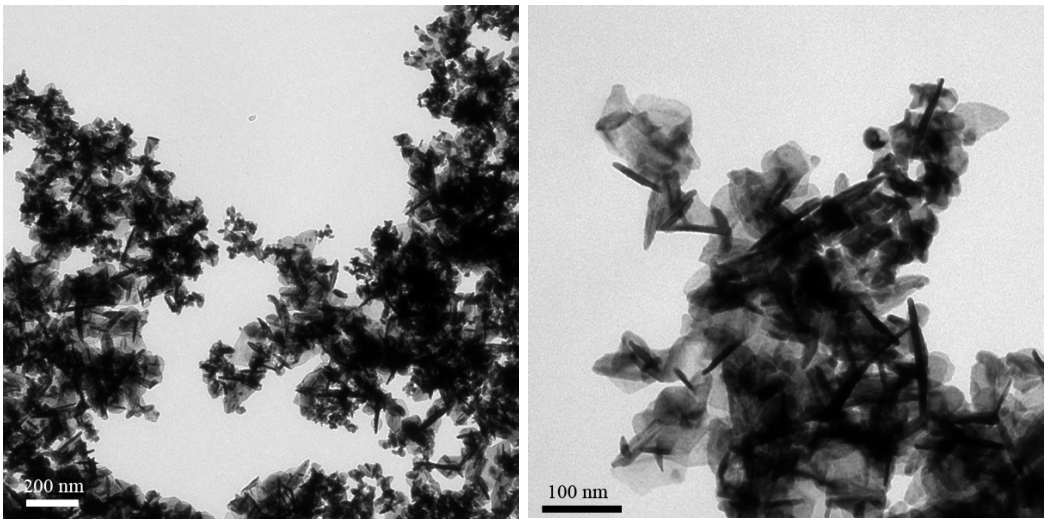

Fig. S8. TEM images of samples produced in the absence of PVP.

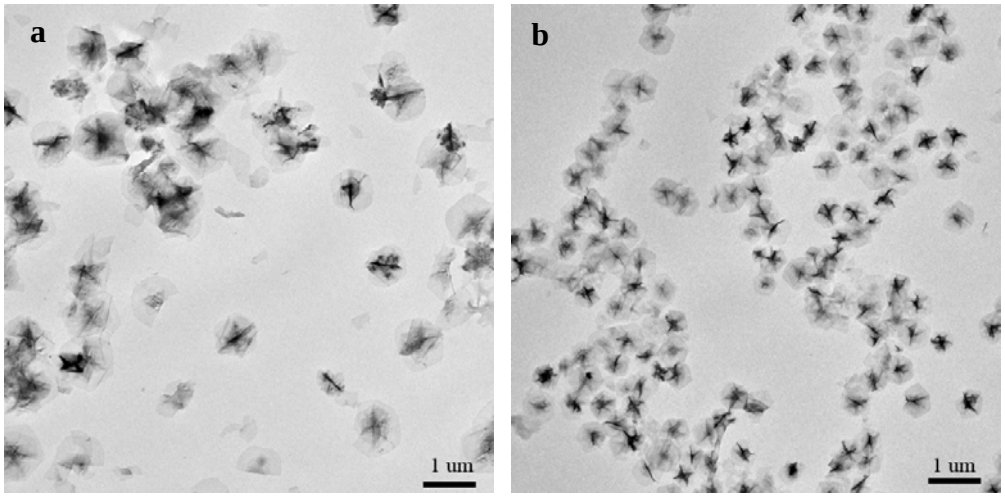

Fig. S9. TEM images of samples produced in the presence of formic acid (a) and propionic acid (b)

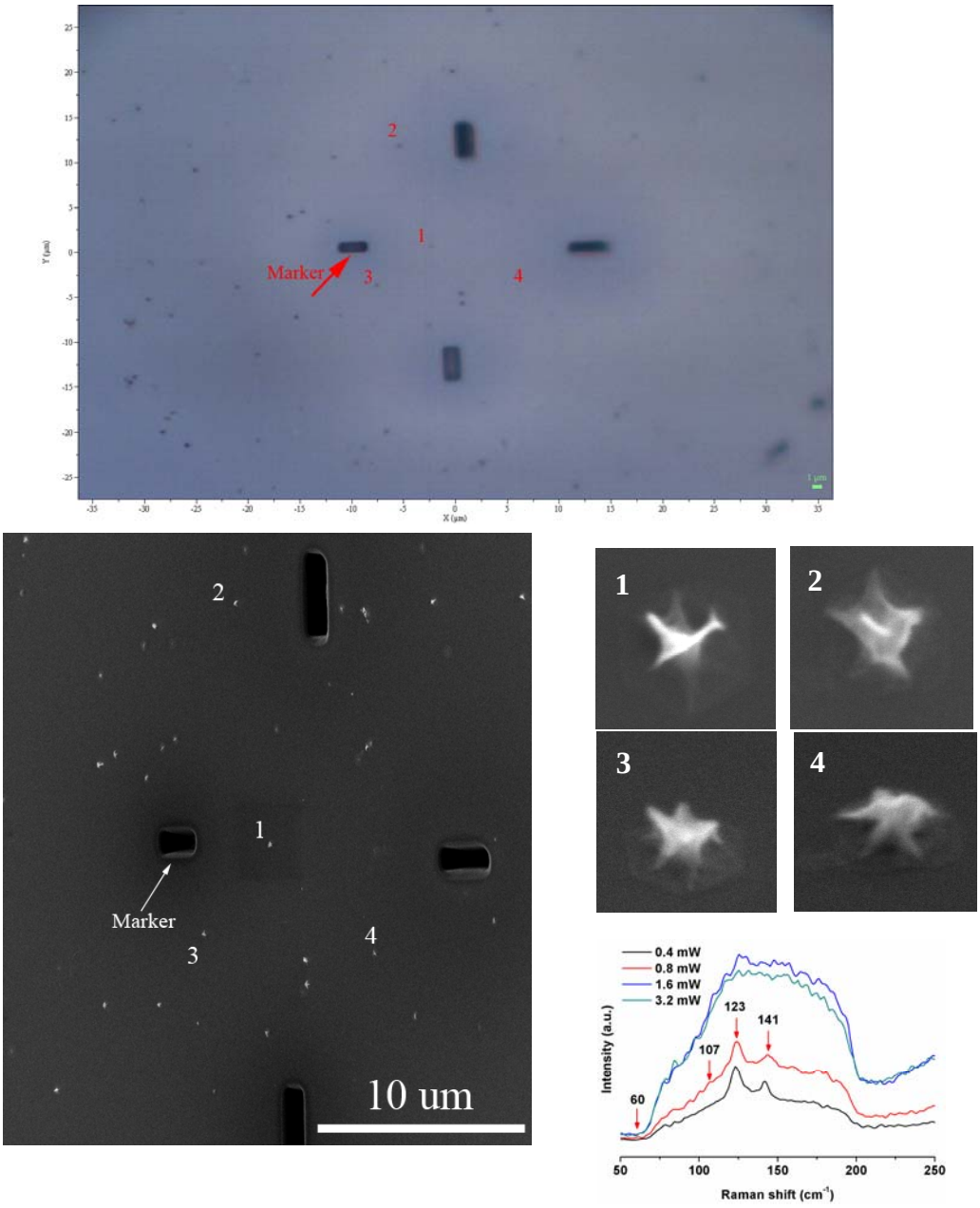

Fig. S10. Optical and corresponding SEM images of flower-like Bi_2Te_3 nanocrystal for Raman test; The Raman spectra of individual flower-like Bi_2Te_3 nanocrystal taken from the different excitation laser power (laser wavelength: 473 nm).