Supporting Information

Materials and Methods

All reagents were of analytic purity and were used without further purification. $Pb(CH_3CO_2)_2 \cdot 3H_2O$ (2mmol) were resolved in 10 mL solution contained with HNO_3 and SDBS, settled for several minutes, then added TAM (2mmol). Microwaved under 254 W for 10 min. After cooling to room temperature, the precipitate was filtered out, washed three times with distilled water, ethanol and then dried with anhydrous diethyl ether.

X-Ray powder diffraction patterns of the products were obtained using a D/max-IIIA X-ray diffractometer equipped with graphite monochromatized Cu-Ka radiation (λ ~1.54056Å). A scanning rate of 0.05°/sec was used to record the patterns in the 2θ range from 20 to 60 degree. The TEM images were taken with a Hitachi Model H-800 transmission electron microscope, using an accelerating voltage of 200 kV. Powdered Samples were ultrasonically dispersed in aqueous ethanol, then a drop of the suspension was placed on a copper grid and dried in air before observation. Scanning electron microscopy (SEM) was performed on a Hitachi S-570 scanning electron microscope operated at 20 kV. Microwave oven is Spectra 900W that made by Sumsung.

PXRD pattern

Typical PXRD pattern of product prepared from $Pb(CH_3CO_2)_2 \cdot 3H_2O$ and TAM show it is cubic PbS (JCPDF card 5-592). Figure S1 is PXRD pattern of Sample 5. That of Other Samples were similar to Figure S1.

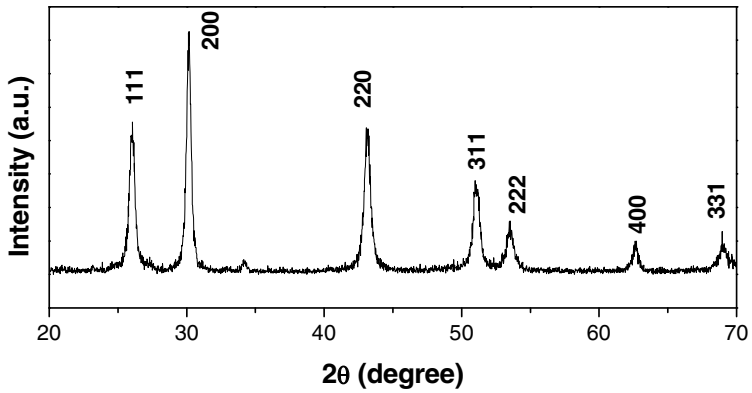

Figure S1 Typical PXRD pattern of Sample 5 prepared from system of $Pb(CH_3CO_2)_2 \cdot 3H_2O$ (2mmol), TAM (2mmol) in aqueous (10mL) in presence of SDBS (6×10^{-4} mol·L^{-1})

Additional Discussion on Sample 1-4:

The ionization of TAM is well documented by Lokhande *et al.*[1] The process of formation of PbS is shown below:

$CH_3CSNH_2 + H^+ = CH_3NH^+ + H_2S$

$H_2S \rightleftharpoons H^+ + HS^-$ $\quad HS^- \rightleftharpoons H^+ + S^{2-}$

$Pb^{2+} + S^{2-} = PbS\downarrow$

The precipitation of PbS made the ionization of TAM proceeded completely. Once the concentration of PbS increase above the solubility limit, the precipitation combine by a nucleation and growth process to form crystals. The more seeds the smaller crystals will form. In our case, large amount of H^+ in acidic solution depressed the ionization of H_2S. The slow release of S^{2-} brought down the number of seeds. The higher acidity of solution, the degree of this kind of depression is deeper. The crystal grew larger kept to ostwald

ripening, which means the growth of larger crystals depleted those of smaller size.

Large scale SEM image of Sample 5:

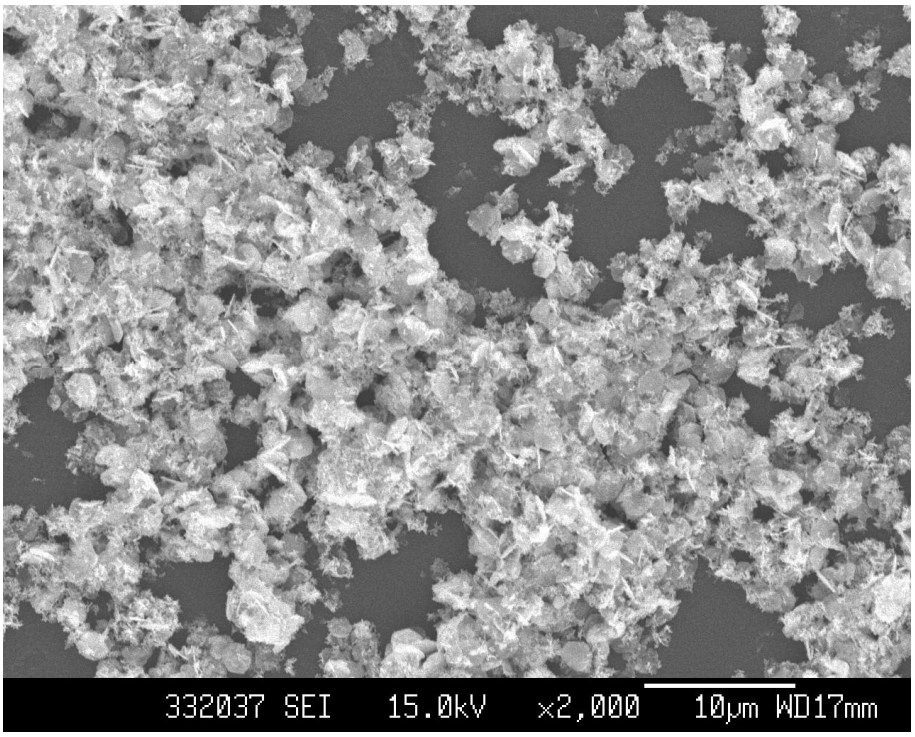

Figure S2. Large scale SEM image of Sample 5

Selected Electron Diffraction Patterns Analysis:

For growth direction of pod in hexapod crystal, the result came from TEM image and selected electron diffraction patterns, as shown in Figure 4. The analysis was shown in Figure S2. Each pod has same length as shown in SEM image (Figure 4). While investigated by TEM, hexapod crystal stood on copper grid. The plane that gave the election diffraction pattern was the one that parallel copper grid and perpendicular to electron beam without tilting copper grid as we did. Only when each pod developed along

<100> axis, the given pattern is [111] zone axis diffraction pattern.

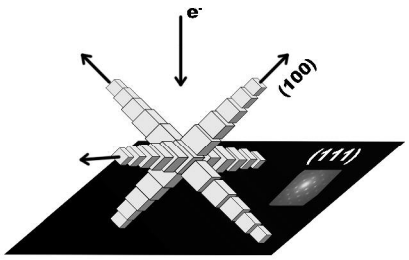

Figure S3: relationship among electron beam of TEM,

plane of diffraction pattern, and grow direction of pods in hexapod crystal

References:

[1] (a) Alexev V., *Qualitative Analysis*, Mir, Moscow, 1971, P. 56
(b) Desai J. D.; Lokhande C. D.; *Mater. Chem. Phys.*, **1995**, *41*, 98