# Supporting Information

# Hybrid chalcogenide nanoparticles: 2D-$WS_2$ nanocrystals inside nested $WS_2$ fullerenes

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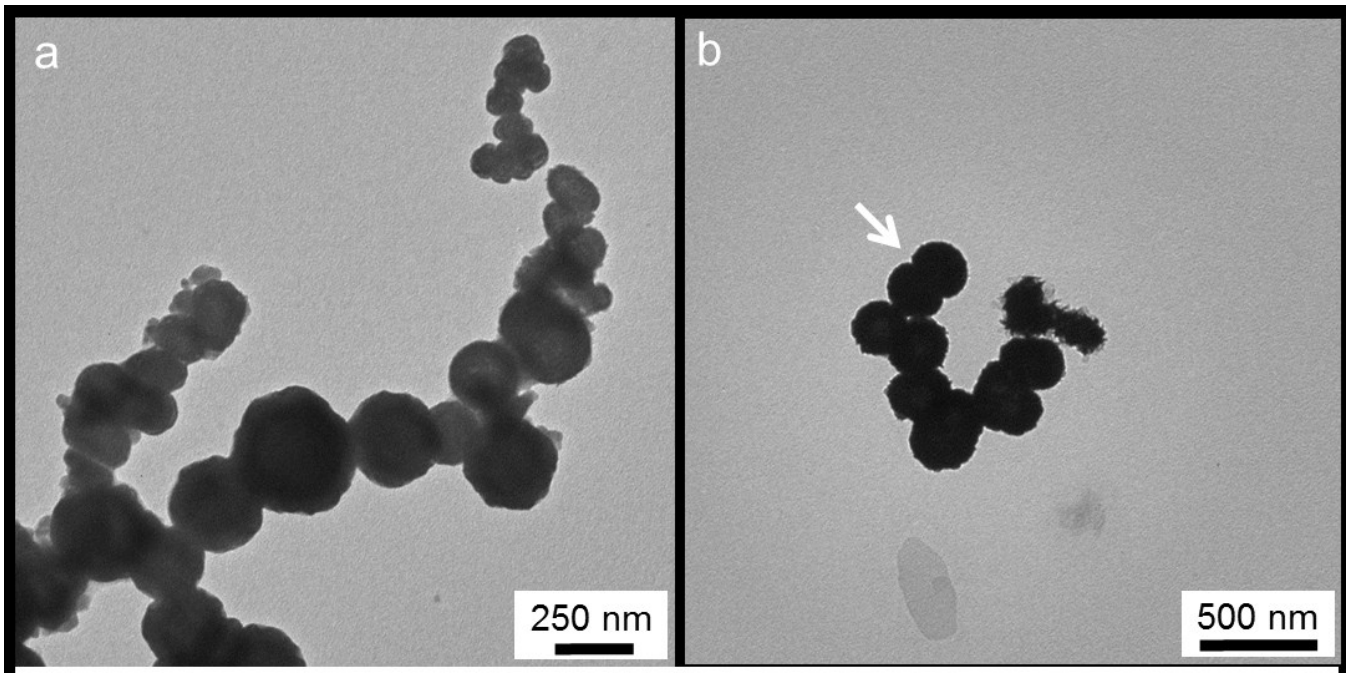


**Figure S1.** TEM images of the primary product obtained after the first step at 600°C. (a) Clusters of spherical particles, (b) Intergrown spherical particles (shown by an arrow).

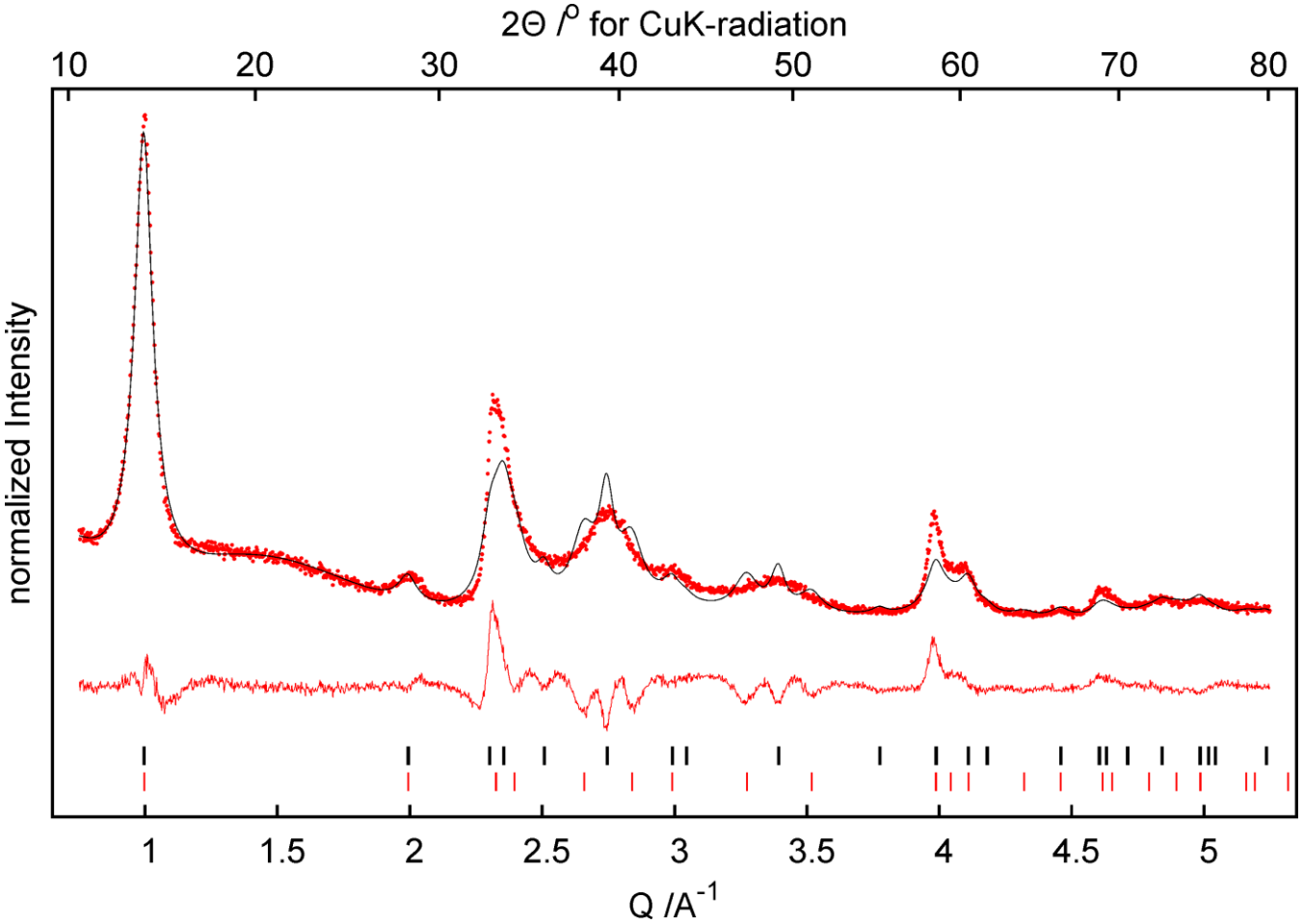


**Figure S2.** Rietveld-refinement of the x-ray diffraction pattern of the final product (red dots: observed intensity, black line: model, red line: difference cureve, ticks marks the reflection positions of 2H-$WS_2$ (black, W.J. Schutte, J.L. DeBoer, F. Jellinek, *J. Solid State Chem.* 1987, **70**, 207-209) and 3R-$WS_2$, (F. Jellinek, J.C. Wildervanck, Z. Anorg. Allg. Chem. 1964, **328**, 309-318 ).

**Table S1**. Measurement and refinemt parameter of the Rietveld refinement of the final product

| | |
|---|---|
| **Diffractometer** | **Siemens D5000** |
| **Sample preparation** | Fine powder fixed between two stripes of Scotch™ tape |
| **Measuring mode** | Transmission |
| **Wavelength** | 1.540596 |
| **Measuring range** | $10 \leq 2\Theta$ /° $\leq 90$; $0.71 \leq Q$ /Å$^{-1} \leq 5.77$ |
| **Temperature /K** | 298K |
| **Profile Fit** | Rietveld refinement according to reported crystal structure models |
| **Background / Parameters** | Chebyshev / 15 |
| **Profile function** | Fundamental Parameters Approach |
| **Program** | TOPAS Academic V5.1 |
| **Total No. of Parameters** | 23 |
| **$R_{exp}$** | 4.6 |
| **$R_{wp}$** | 13.0 |
| **GoF** | 2.86 |
| **Phase I** | $WS_2$-2H |
| **Space group** | *P*6$_3$/*mmc* |
| **Cell parameters /Å** | a = 3.151(1) Å, c = 12.600(5) Å |
| **Crystallite size / nm** | 10(1) |
| **Fraction /%wt** | 34(2) |
| **Biso** | 2.8(1) |
| **Phase II** | $WS_2$-3R |
| **Space group** | *R*3*m* (hexagonal setting) |
| **Cell parameters /Å** | a = 3.151(1) Å, c = 18.900(5) Å |
| **Crystallite size / nm** | 6(1) |
| **Fraction /%wt** | 66(2) |
| **Biso** | 2.8(1) |

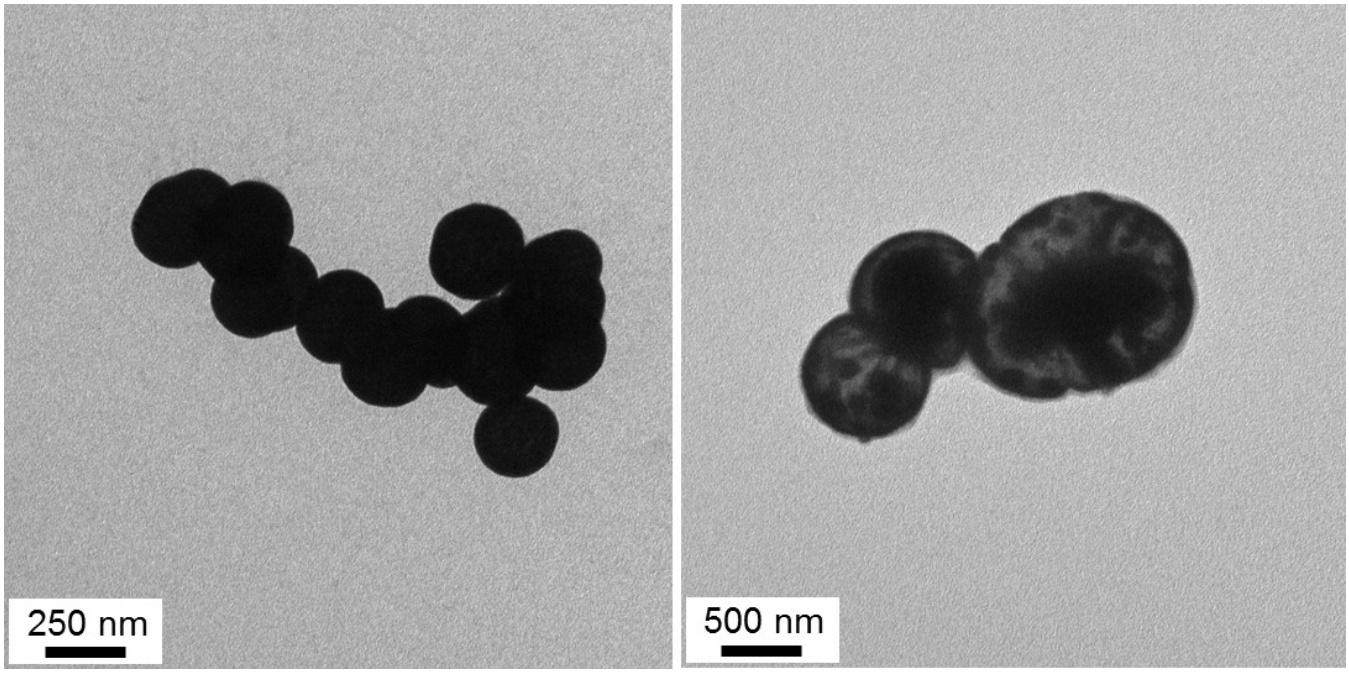


**Figure S3.** TEM overview image of the product obtained at the annealing temperature of 750°C

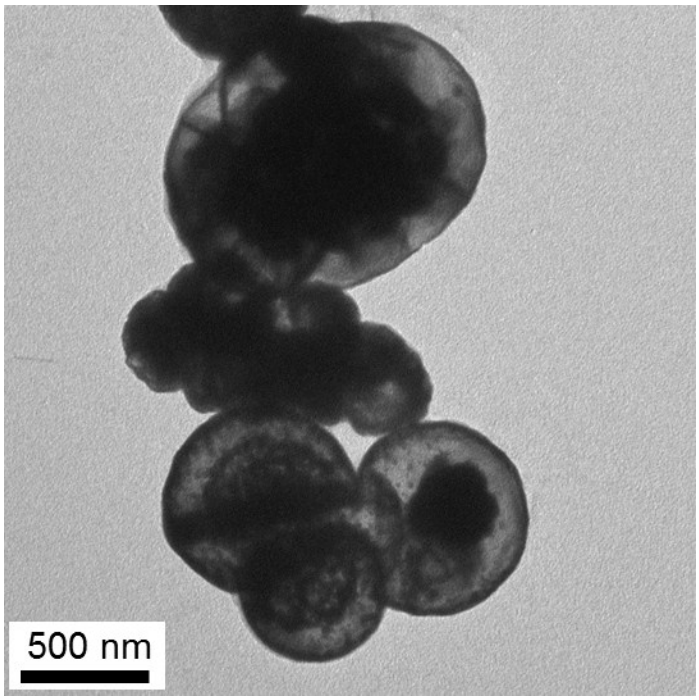


**Figure S4.** TEM overview image of the product obtained at the annealing temperature of 800°C.

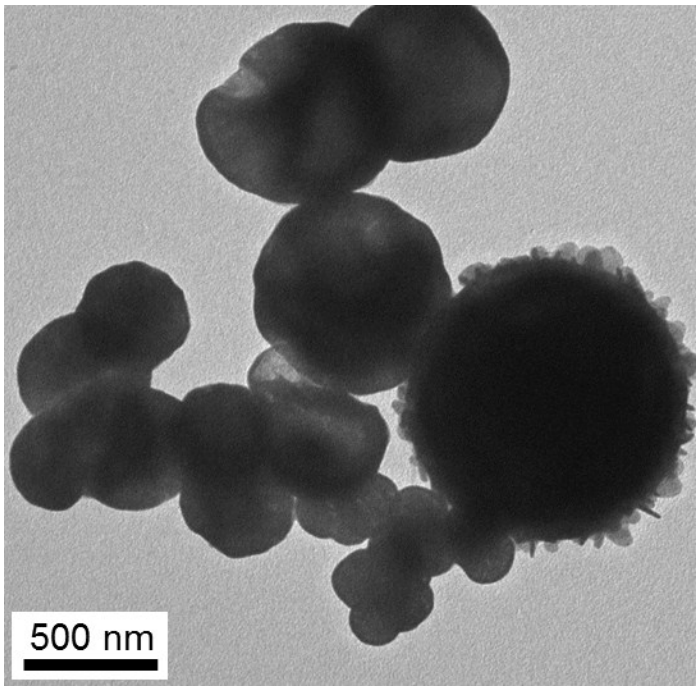


**Figure S5.** TEM overview image of the product obtained at the annealing temperature of 900°C.

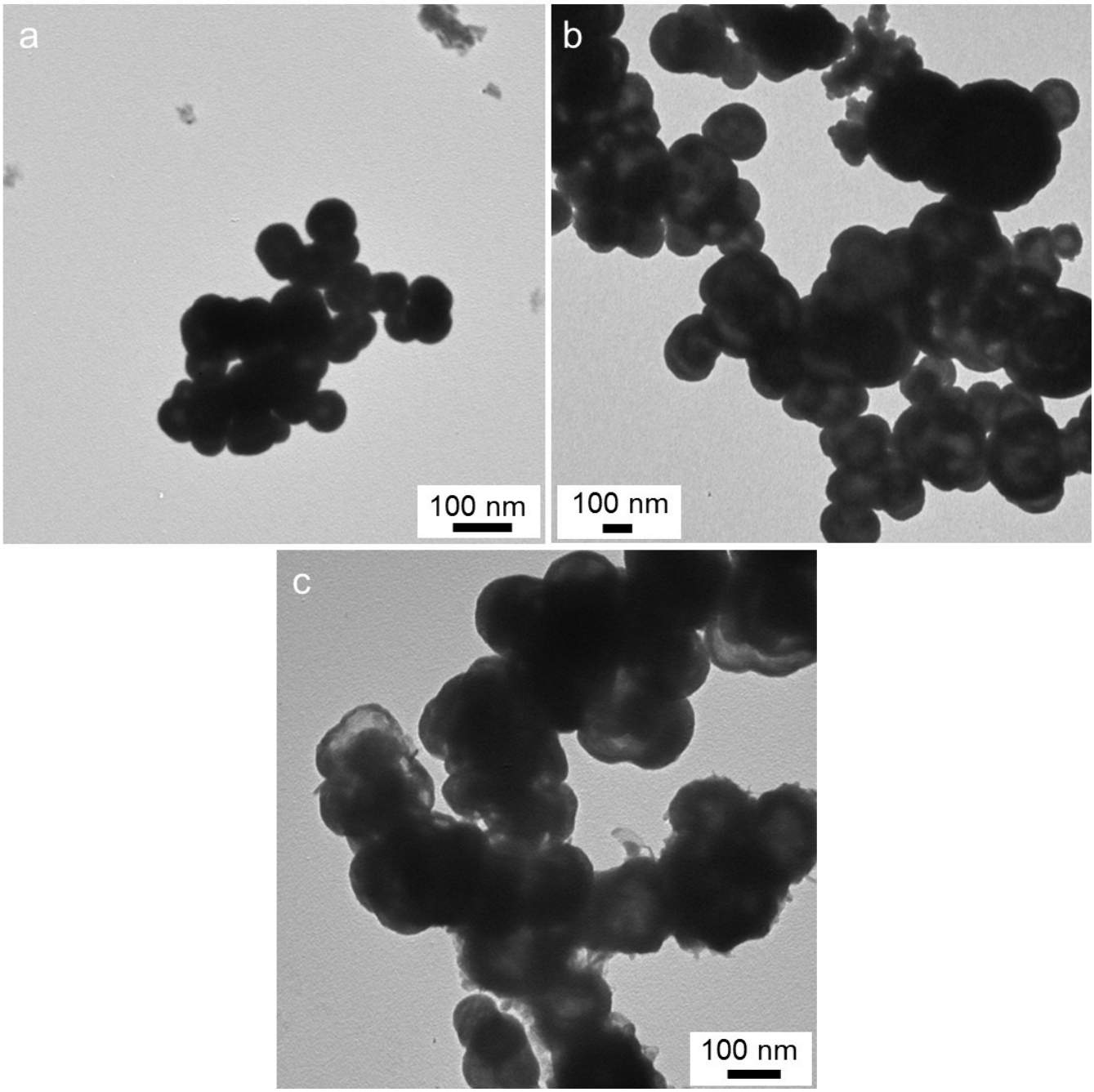


**Figure S6.** TEM images of the products obtained from reactions at (a) 300°C, (b) 400°C and (c) 500°C.

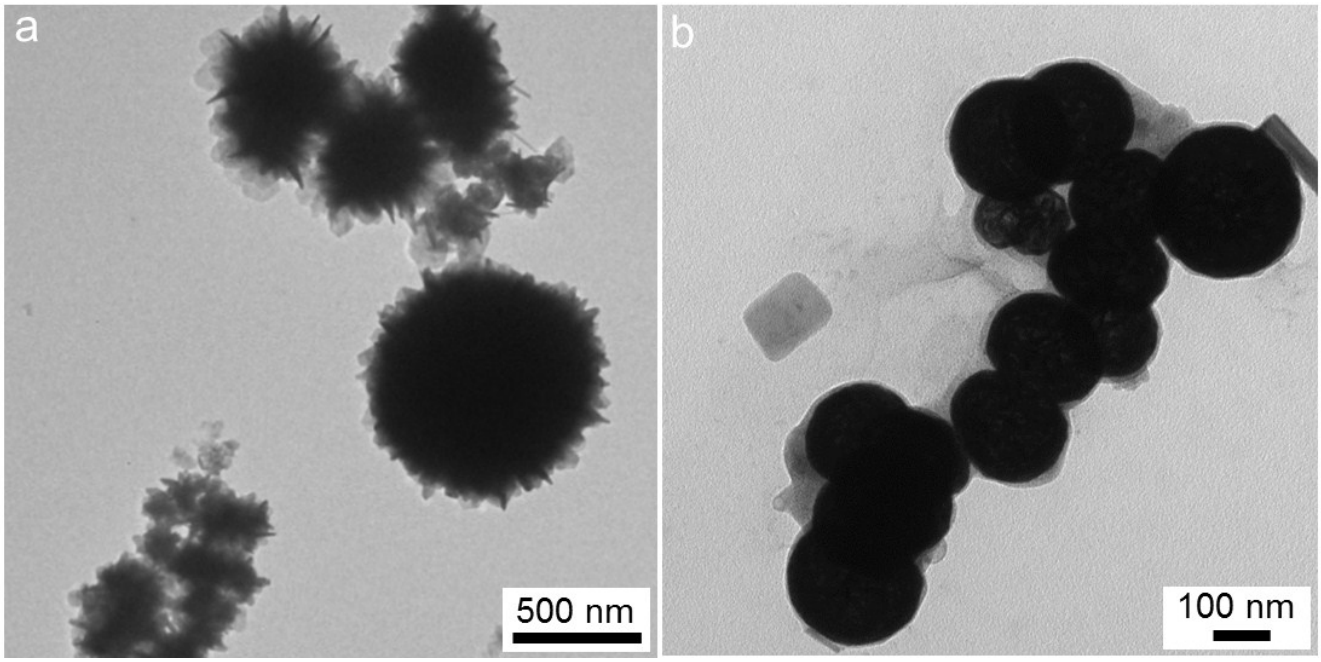


**Figure S7.** TEM image of the annealed product obtained (a) without iodine and (b) for a $W(CO)_6/I_2$ ratio of 1:1.

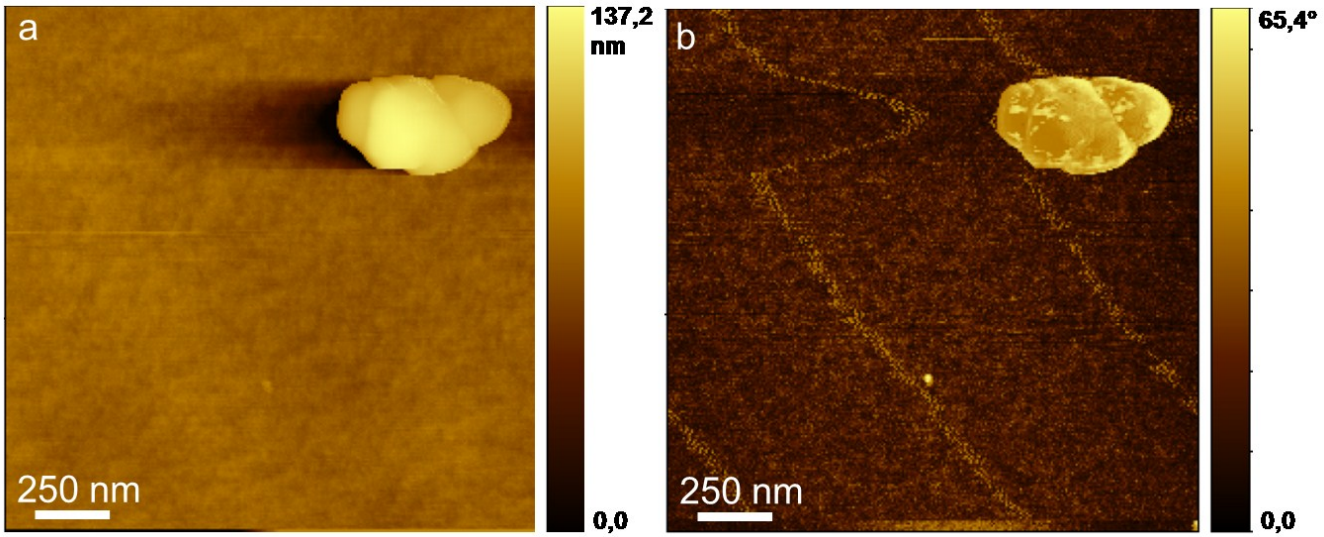


**Figure S8.** (a) AFM height profile of as-synthesized IF-$WS_2$ particle. (b) Phase profile of IF-$WS_2$ particles.