Supplementary information

The synthesis process was carried out by chemical vapour deposition inside a quartz tube in a conventional tube furnace (Instron SFL furnace model: 4850A) at temperatures ranging from 650^{O}C-950^{O}C. The precursors WCl_6 (2mmol-99.9% purity) and colloidal sulphur (20mmol-80%purity) were placed at particular positions inside the quartz tube: sulphur at 13.5cm from quartz tube, WCl_6 at 18.5cm away in same direction and a (100) silicon substrate at 23.5cm. This arrangement ensured that the precursors and substrate are at the core of the furnace during the reaction. This setup was connected to argon flow of about 100sccm with the precursors as far away from the hot zone of the furnace as possible, to prevent any reactions whilst heating the furnace. Once the furnace reached the desired temperature, the reactants were quickly pushed into the hot zone. The reaction was allowed to take place in the furnace for the stipulated time (5min or 10min), after which the tube was either taken out (quenched experiment) or just left in the furnace for cooling to room temperature (left inside experiment) with the furnace switched off and the argon flow at 100sccm.

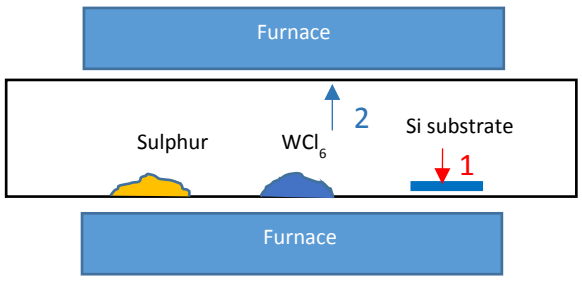


Figure S1. Schematic diagram of CVD setup

X-Ray Diffraction (XRD) (Fig.2) was used to determine the chemical composition of the material deposited and the presence of crystal planes (002) which belonged to the WS_2 crystalline phase has been observed. The prominent signal of the (002) peak indicates the presence of well-stacked layered structure in the material deposited. The XRD plot has been indexed to the hexagonal structure of WS_2 with lattice constants: a=3.153, c=12.32 A^{o}

(JCPDS card No: 84-1398). The Raman spectroscopy shows the characteristic A_1g (352 cm^{-1}) and E_2g (420 cm^{-1}) belonging to WS_2.

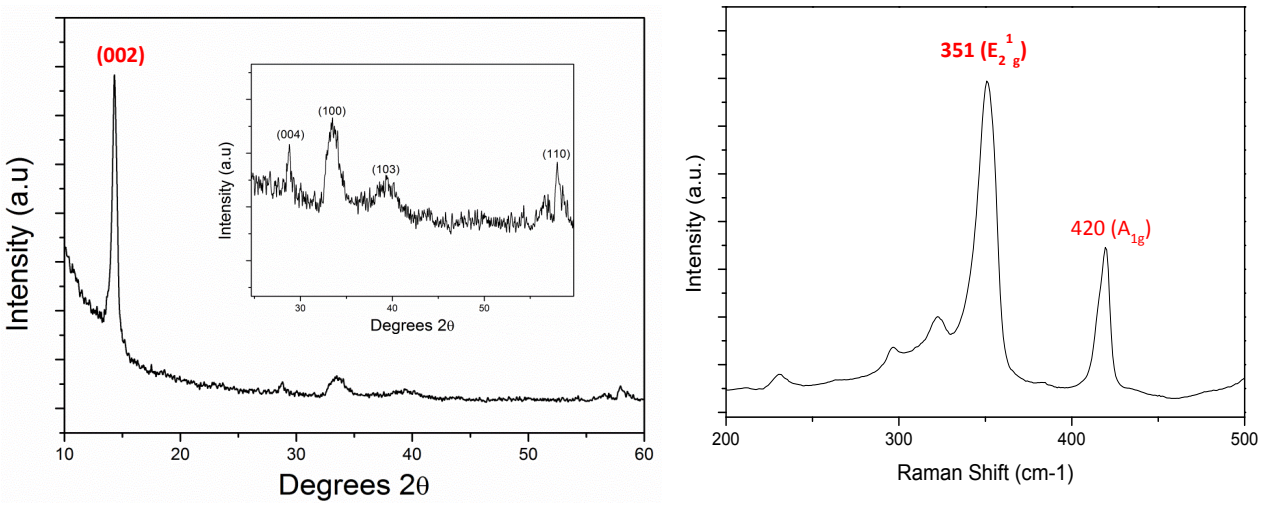
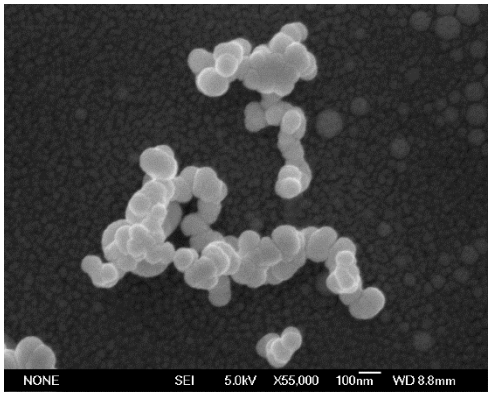
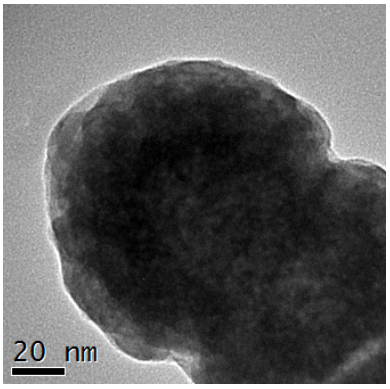


Figure S2. XRD and Raman of nanoflower deposited at 850 °C and 5 min

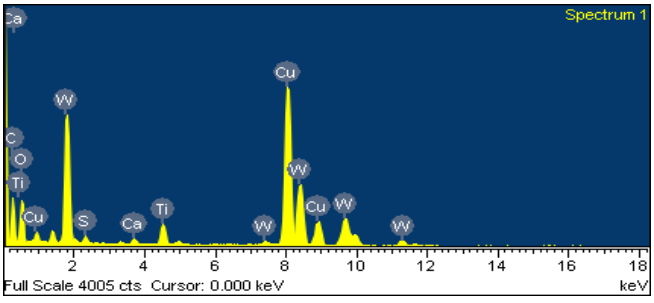
a)



b)



c)



d)

Element	Weight%	Atomic%
C K	6.37	30.32
O K	4.25	15.19
S K	0.68	1.21
Ca K	0.57	0.81
Ti K	2.97	3.55
Cu K	38.15	34.31
W L	47.01	14.61
Totals	100.00	

Figure S3.a) SEM micrograph b) TEM micrograph c) EDX mapping d) quantitative results for EDX of nanoparticles formed at 850 °C and time period of 10 s.