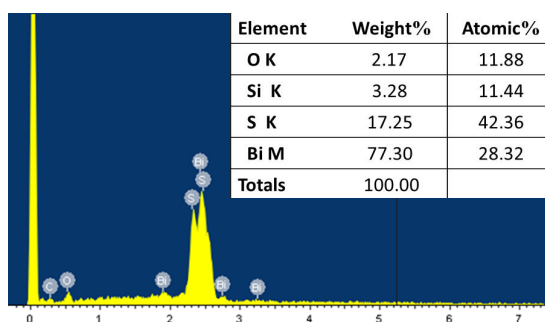


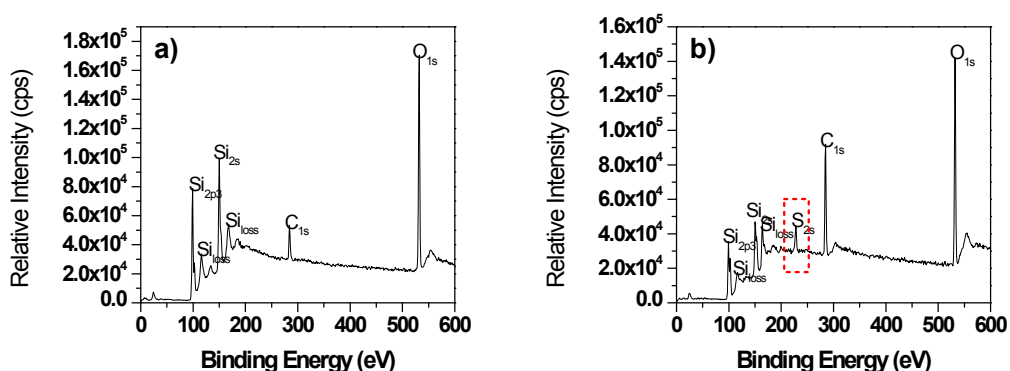
## Supporting Information

# Inducing Nucleation and Growth of Chalcogenide Nanostructures on Silicon Wafers

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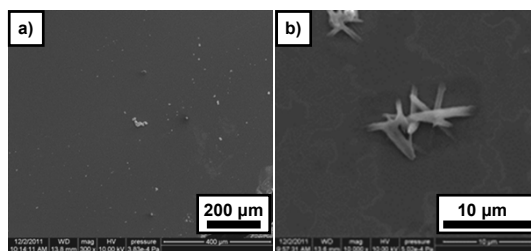


**Figure S1** EDS analysis of the synthetic  $\text{Bi}_2\text{S}_3$ , which shows that the molar ratio between Bi and S atom is about 1: 1.496, closing to the stoichiometric ratio of  $\text{Bi}_2\text{S}_3$ .

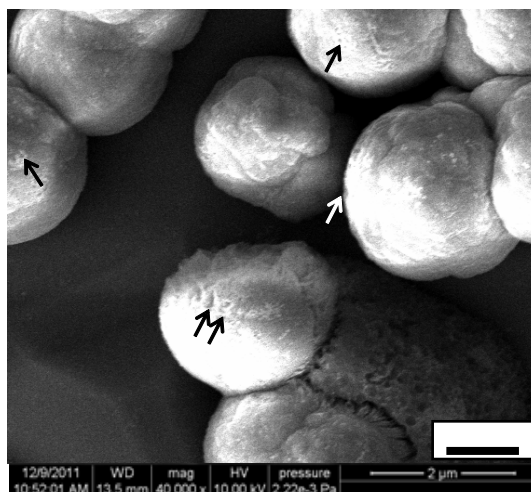


**Figure S2** XPS spectra of the clean silicon substrates (a) and the silicon substrates modified by 3-MPTES (b).

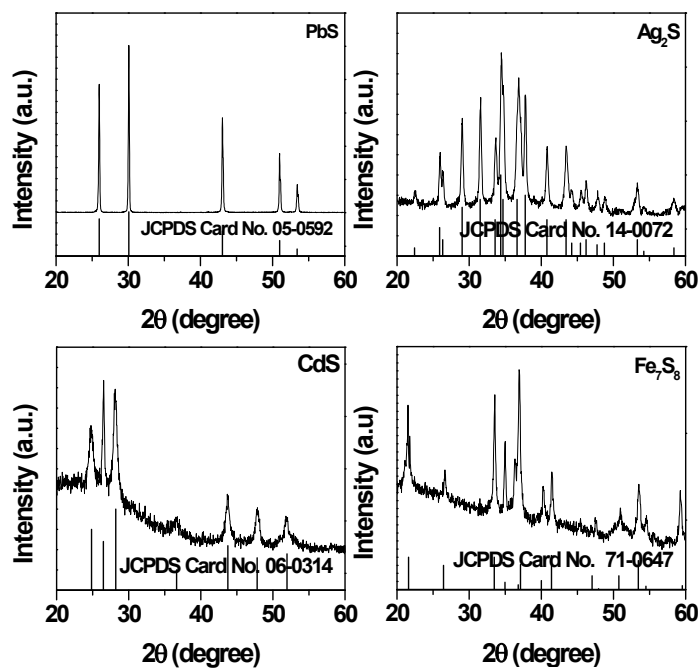
As shown in Figure S2a, all peaks can be assigned to C, O, and Si elements. The binding energy of the  $\text{C}_{1s}$  transition was used as a reference to standardize the binding energy of other elements. The oxygen peak may be attributed to the  $\text{O}_2$  or  $\text{CO}_2$  adsorbed onto the samples from the atmosphere, or the  $\text{Si}(\text{OH})_3$  groups on the surface after hydrophilic treatment. Two strong peaks at 99 and 150 eV in the XPS spectra are assigned to  $\text{Si}_{2p^3}$  and  $\text{Si}_{2s}$ , respectively. The peak at 228 eV corresponding to the  $\text{S}_{2s}$  transition only appeared in Figure S2b, suggesting the coverage of the thiol groups on the silicon substrate with surface modifications by 3-MPTES.



**Figure S3** SEM images of (a, b) the directly growth Bi<sub>2</sub>S<sub>3</sub> on the unfunctionalized substrate by 3-MPTES. After the reaction, the silicon surface is almost bare. Only a few of grains exist in the surfaces of the silicon substrates.



**Figure S4** At the initial stage (4 h at 50 °C), the products are sphere structure with any lacuna on the surface of Bi<sub>2</sub>S<sub>3</sub> spheres, as indicated by arrows in SEM image.



**Figure S5** The XRD patterns of the as-prepared PbS, Ag<sub>2</sub>S, CdS, and Fe<sub>7</sub>S<sub>8</sub> micro-/nanostructures, respectively.