Creation of Cadmium Sulfide Nanostructures Using AFM Dip-Pen Nanolithography

Lei Ding, Yan Li*, Haibin Chu, Xuemei Li, and Jie Liu*

Supporting Materials:

Figure S1. The two and three-dimensional topographic AFM images of CdS nanopattern drawn on negatively charged silicon surface generated in a mixture of NH₃, H₂O₂ and H₂O (NH₃/H₂O₂/H₂O = 1:1:6, v/v). The AFM tip was translated across the surface at a rate of 100 nm/s under the relative humidity of 40%. The temperature was 25°C. The wafer was treated in 100°C piranha solution (NH₃/H₂O₂/H₂O = 1:1:6, v/v) for 30 min, then copiously rinsed with water, and blow dry with high purity nitrogen before used for the deposition.
**Figure S2.** The XPS spectra of the modified mica surface with CdS spots (a and b).

The XPS data were taken on an AXIS-Ultra instrument from Kratos Analytical using monochromatic Al Kα radiation (225 W, 15 mA, 15 kV) and low-energy electron flooding for charge compensation. To compensate for surface charge effects, binding energies were calibrated using C1s hydrocarbon peak at 284.8 eV.

X-ray photoelectron spectroscopy (XPS) was used to verify that the nanofeatures deposited on the mica surface in the DPN process were composed of CdS. Figure S4a and Figure S4b show the XPS spectra of the modified mica surface with CdS spots. The Cd3d5/2 bending-energy peak was observed at 405.2 eV, the M4N45N45 peak was observed at 1105.5 eV. The modified Auger parameter can be calculated by the equation:

$$ \text{Modified Auger Parameter} = E_{\text{Cd}3d_{5/2}} - E_{\text{M}4\text{N}45\text{N}45} + h\nu_{\text{monoAl}} (1486.7 \text{ eV}) $$
After introducing the data into the equation and calculating, we get the Modified Auger Parameter 786.4 eV, which is in good accordance with the reported data of 786.5 eV for CdS.¹

Reference: