

## **Supporting Information**

### **Improving the performance of quantum dot sensitized solar cells through CdNiS quantum dots with reduced recombination and enhanced electron life time**

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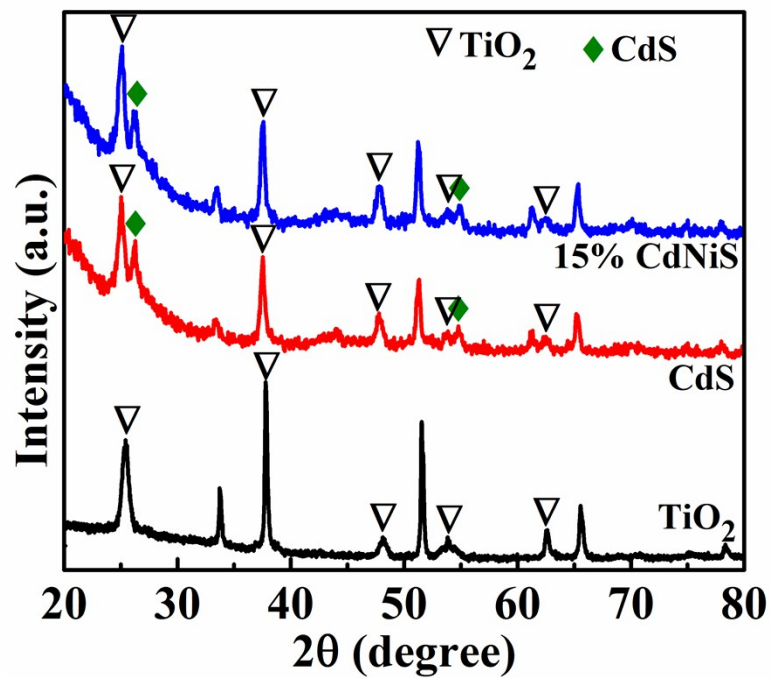
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**Table S1.** Composition of elements in CdS, 5%CdNiS, 10%CdNiS, 15%CdNiS, and 20%CdNiS electrodes using energy dispersive X-ray spectroscopy (EDS) analysis.

| <b>Electrodes</b> | <b>Atomic (%)</b> |          |           |           |          |
|-------------------|-------------------|----------|-----------|-----------|----------|
|                   | <b>Ti</b>         | <b>O</b> | <b>Cd</b> | <b>Ni</b> | <b>S</b> |
| <b>CdS</b>        | 25.99             | 53.67    | 8.88      | -         | 11.46    |
| <b>5%CdNiS</b>    | 25.82             | 53.62    | 8.38      | 0.76      | 11.42    |
| <b>10%CdNiS</b>   | 26.03             | 53.45    | 8.13      | 0.94      | 11.45    |
| <b>15%CdNiS</b>   | 26.09             | 53.37    | 7.89      | 1.19      | 11.46    |
| <b>20%CdNiS</b>   | 26.08             | 53.34    | 7.56      | 1.53      | 11.49    |

**Table S2.** Solar cell parameters of QDSSC (multiple cells) with CdS and Ni-doped CdS photoanodes.

| <b>Counter Electrode</b>  | <b>V<sub>OC</sub> (V)</b> | <b>J<sub>SC</sub> (mA cm<sup>-2</sup>)</b> | <b>FF</b> | <b>η (%)</b> |
|---------------------------|---------------------------|--------------------------------------------|-----------|--------------|
| <b>CdS (Cell1)</b>        | 0.601                     | 7.39                                       | 0.451     | 2.00         |
| <b>CdS (Cell 2)</b>       | 0.603                     | 7.40                                       | 0.451     | 2.01         |
| <b>CdS (Cell 3)</b>       | 0.604                     | 7.37                                       | 0.452     | 2.02         |
| <b>5% CdNiS (Cell 1)</b>  | 0.619                     | 7.54                                       | 0.504     | 2.36         |
| <b>5% CdNiS (Cell 2)</b>  | 0.612                     | 7.60                                       | 0.506     | 2.36         |
| <b>5% CdNiS (Cell 3)</b>  | 0.617                     | 7.55                                       | 0.502     | 2.34         |
| <b>10% CdNiS (Cell 1)</b> | 0.619                     | 8.01                                       | 0.493     | 2.45         |
| <b>10% CdNiS (Cell 2)</b> | 0.626                     | 7.99                                       | 0.485     | 2.42         |
| <b>10% CdNiS (Cell 3)</b> | 0.637                     | 8.01                                       | 0.495     | 2.47         |
| <b>15% CdNiS (Cell 1)</b> | 0.643                     | 8.91                                       | 0.543     | 3.11         |
| <b>15% CdNiS (Cell 2)</b> | 0.633                     | 9.02                                       | 0.553     | 3.16         |
| <b>15% CdNiS (Cell 3)</b> | 0.639                     | 8.95                                       | 0.542     | 3.10         |
| <b>20% CdNiS (Cell 1)</b> | 0.623                     | 8.78                                       | 0.541     | 2.96         |
| <b>20% CdNiS (Cell 2)</b> | 0.629                     | 8.73                                       | 0.545     | 2.99         |
| <b>20% CdNiS (Cell 3)</b> | 0.611                     | 8.86                                       | 0.541     | 2.93         |



**Fig. S1** XRD patterns of the TiO<sub>2</sub>, CdS and 15% CdNiS films.