Electronic Supporting information

Photoelectrochemical cells by design: 3D Nanoporous CdO-CdSe architectures on ITO

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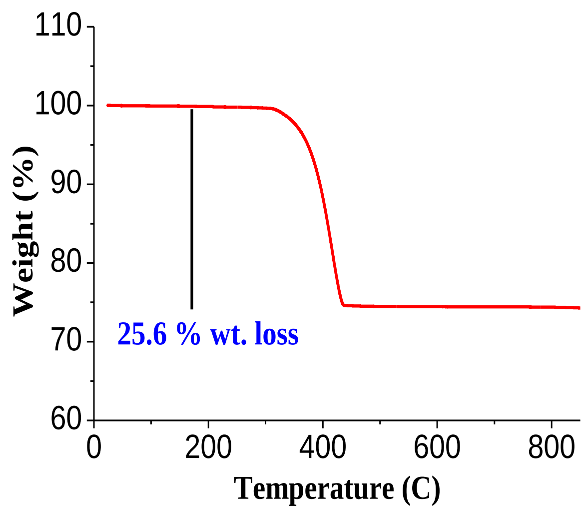

Figure S1. Thermo-gravimetric analysis (TGA) of $CdCO_3$ crystals obtained under nitrogen flow at heating rate of 10 ºC min^{-1}

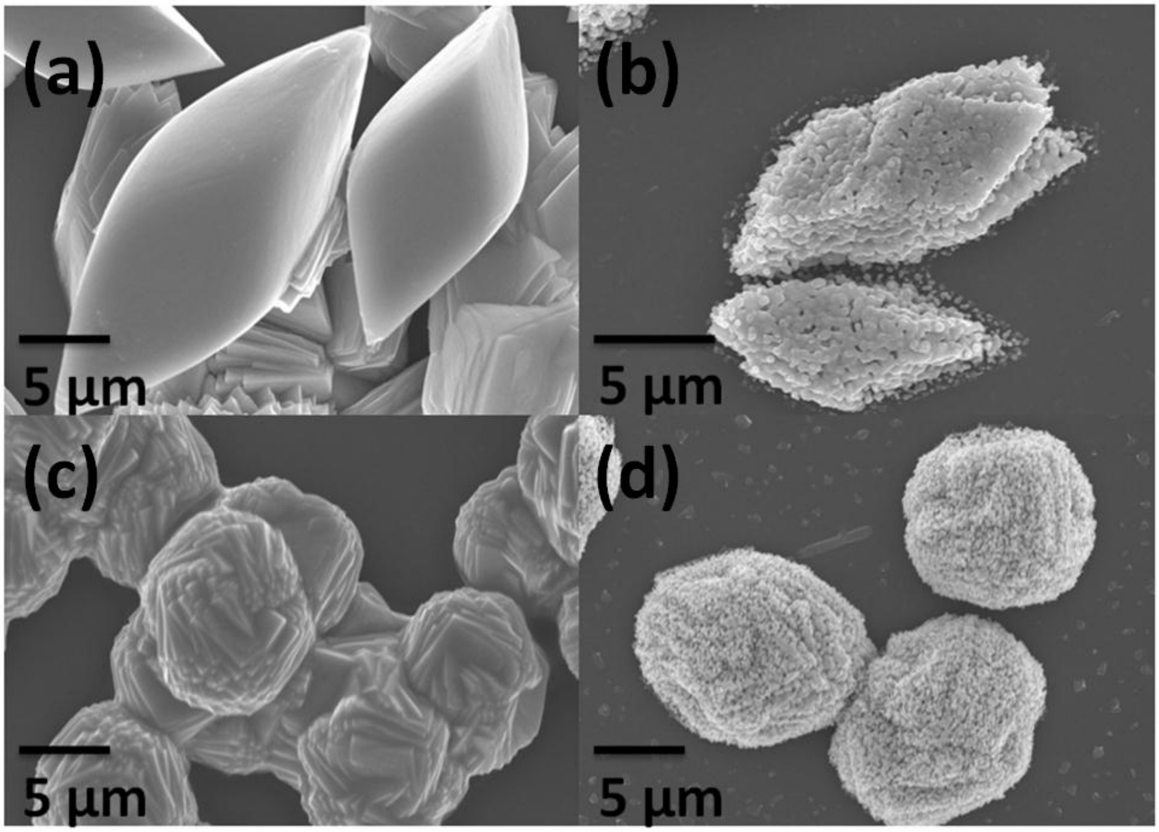

Figure S2. SEM images of the $CdCO_3$ and CdO crystals obtained using $CdSO_4$ (a) and $Cd(CH_3COO)_2$ (c) as Cd^{2+} ion precurssors.

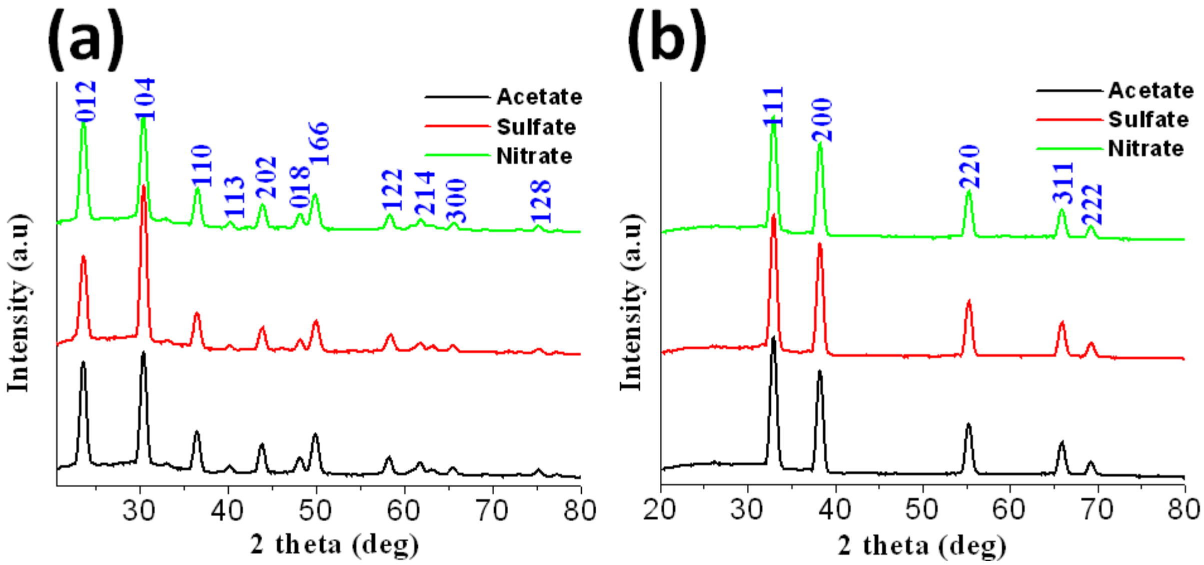

Figure S3. XRD patterns of (a) $CdCO_3$ and (b) CdO crystals obtained using different Cd^{2+} ion precurssors

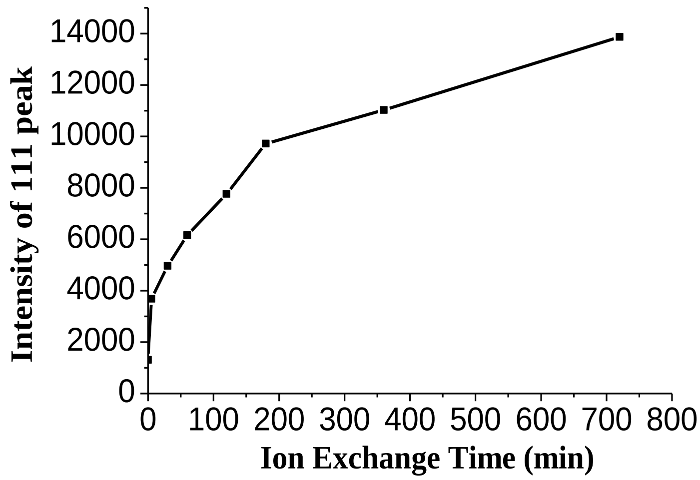

Figure S4. Intensity of CdSe <111> reflection peak of CdO-CdSe architectures formed at different ion exchange time intervals plotted versus ion exchange time. A rough estimate of speed of ion exchange reaction can be obtained from this graph.

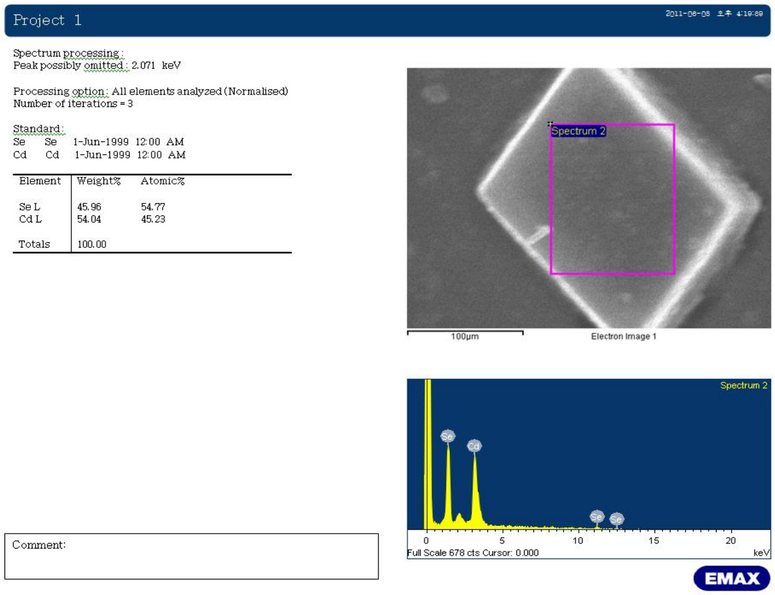

Figure S5. EDX analysis of CdO-CdSe crystal obtained after 30 min. of ion exchange reaction

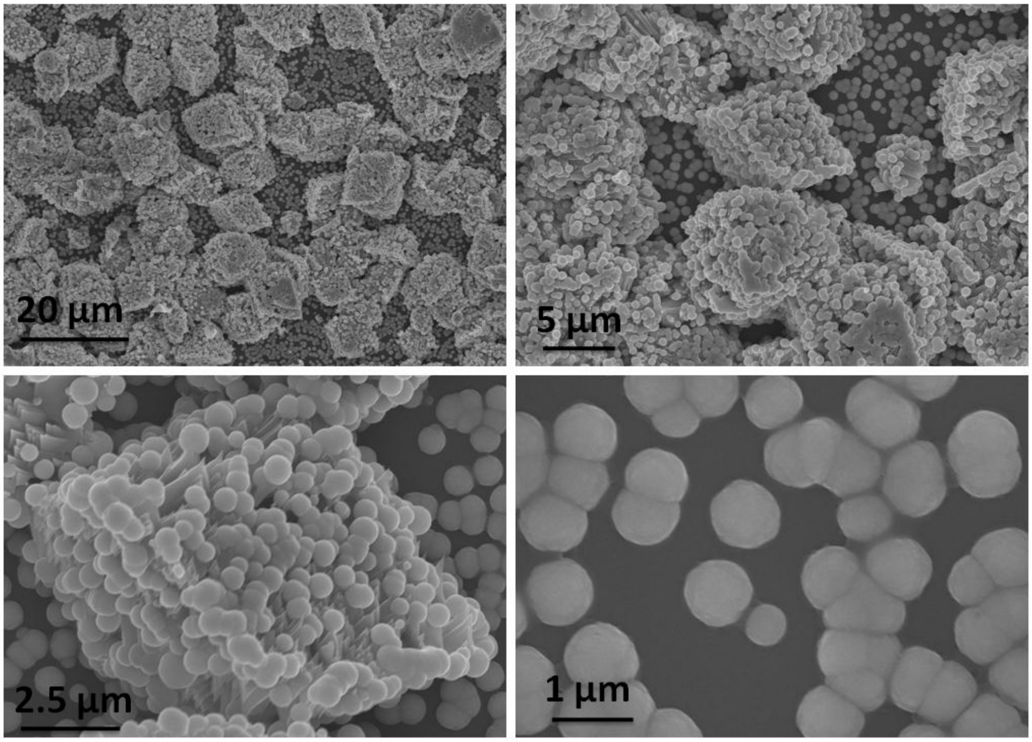

Figure S6. SEM images of the $CdCO_3$ crystals with different magnifications, after ion exchnage with Se^{2-} ion solution

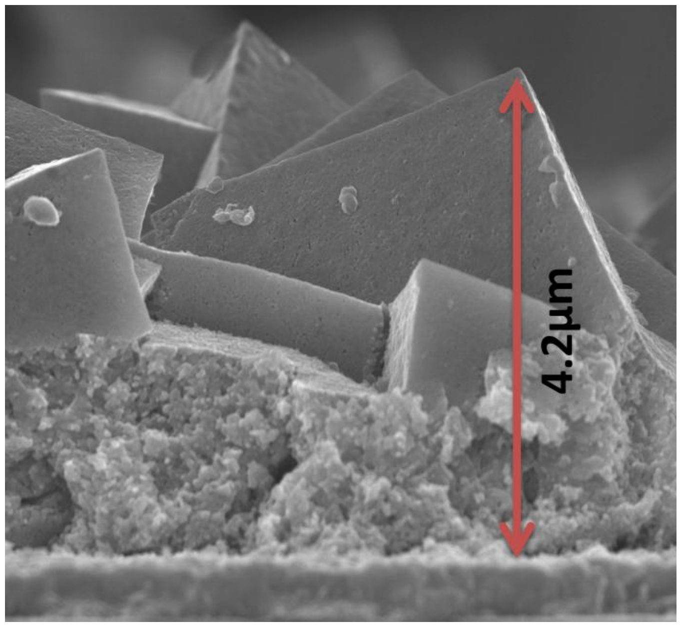

Figure S7. Cross secation SEM image of the CdO architectures on ITO surface.

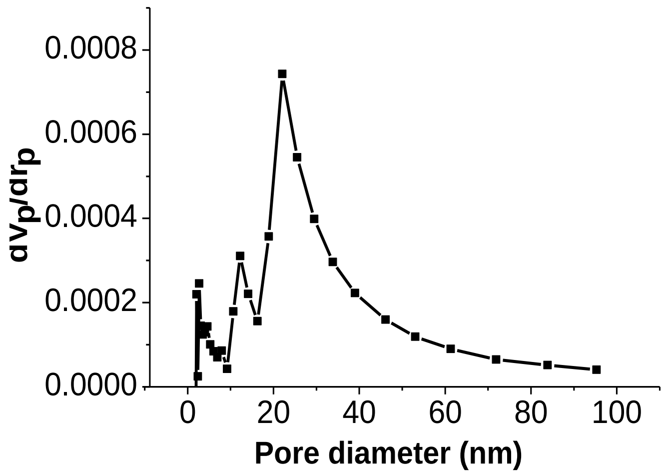

Figure S8. Pore size distribution of CdO architectures obtained by BET analysis.

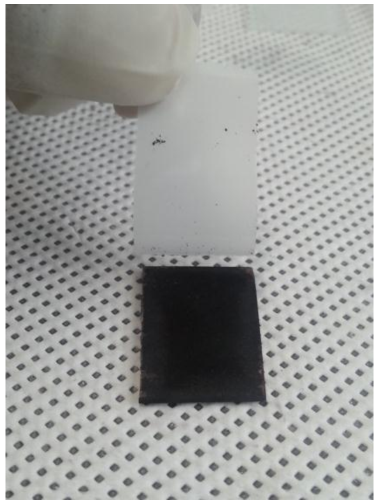

Figure S9. Scotch tape after complete removal from ITO/CdO-CdSe architecture surface

The CdO-CdSe architectures prepared by a facile chemical route on ITO substrate were tested for adhesion by sticking a scotch tape on the surface of the film and removing it. As can be seen from the figure above, the amount of architectures removed by the scotch tape is negligible except some particles at the very edges, indicating the good adhesion of these chemically deposited architectures.

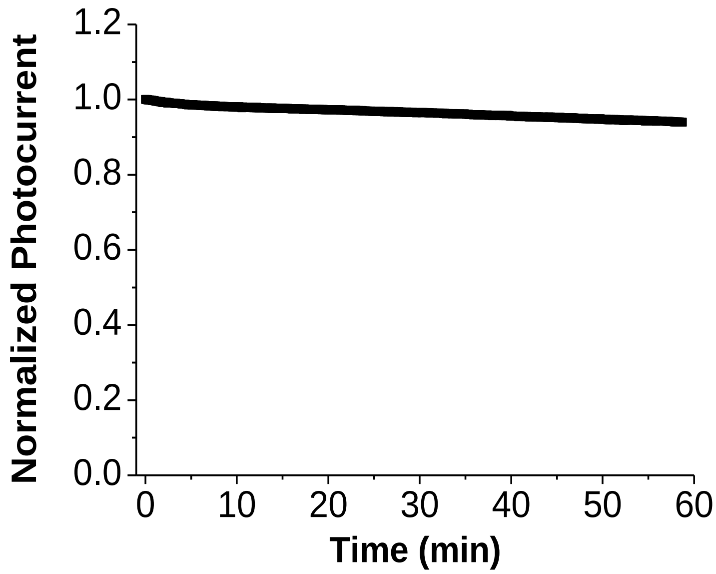

Figure S10. A plot of normalized Short-circuit current density versus time of the CdO-CdSe photoelectrochemical cell obtained under continuous illumination of 1Sun for 1 hour. Almost 93 % of photocurrent was retained after 1 hour of continuous illumination. With a proper sealant, it should be possible to avoid electrolyte evaporation during long-term irradiation which would give more stability to the device.

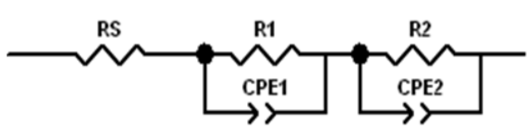

Figure S11. An equivalent circuit used to fit the Nyquist plots of the CdO-CdSe photoelectrochemical cells.

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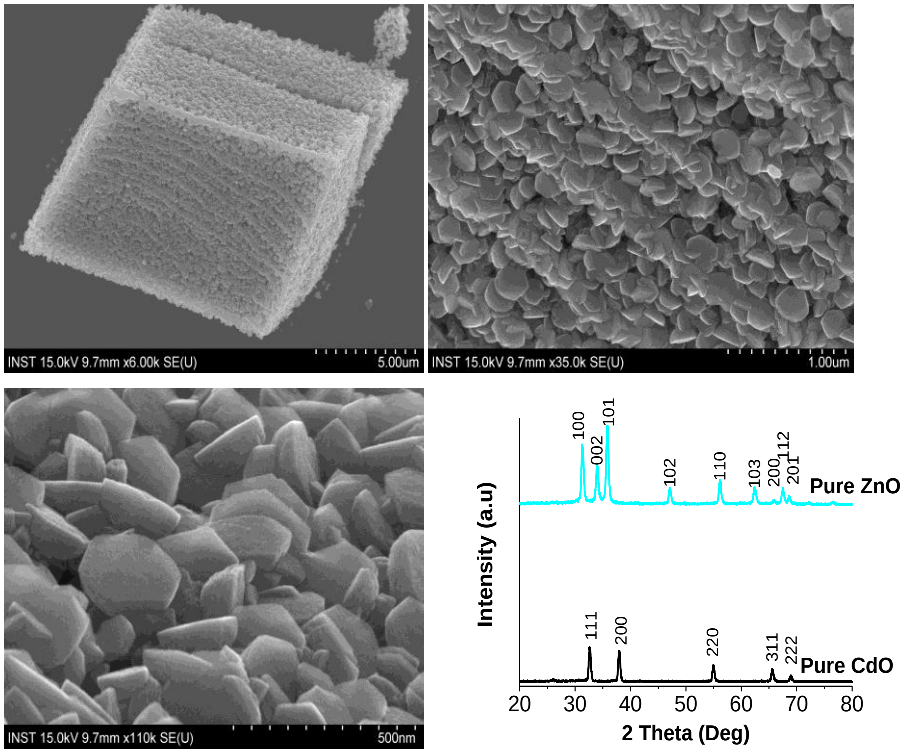

Figure S12. Shows low and high magnification SEM images and XRD pattern of porous ZnO architectures formed by ion exchange with CdO. The concept of ion exchange in CdO porous architectures can be further extended to the fabrication of porous ZnO architectures. When CdO architectures were kept in a solution containing Zn^{2+} ions, Cd^{2+} ions were immediately replaced with Zn^{2+} ions forming porous ZnO architectures. In this case also, the architectures retained there outer shape (macroscopic structure) similar but changed their internal nanostructure. The chemical transformation of CdO to ZnO is favored by thermodynamic driving force of about -64.79 KJ/mol. It is important to note here that cubic CdO gets transformed to Hexagonal ZnO due to high stability of latter compared to cubic ZnO.