Supplementary Material (ESI) for CrystEngComm

Supporting Information

Controllable growth and optical properties of ZnO nanostructures on Si nanowire arrays

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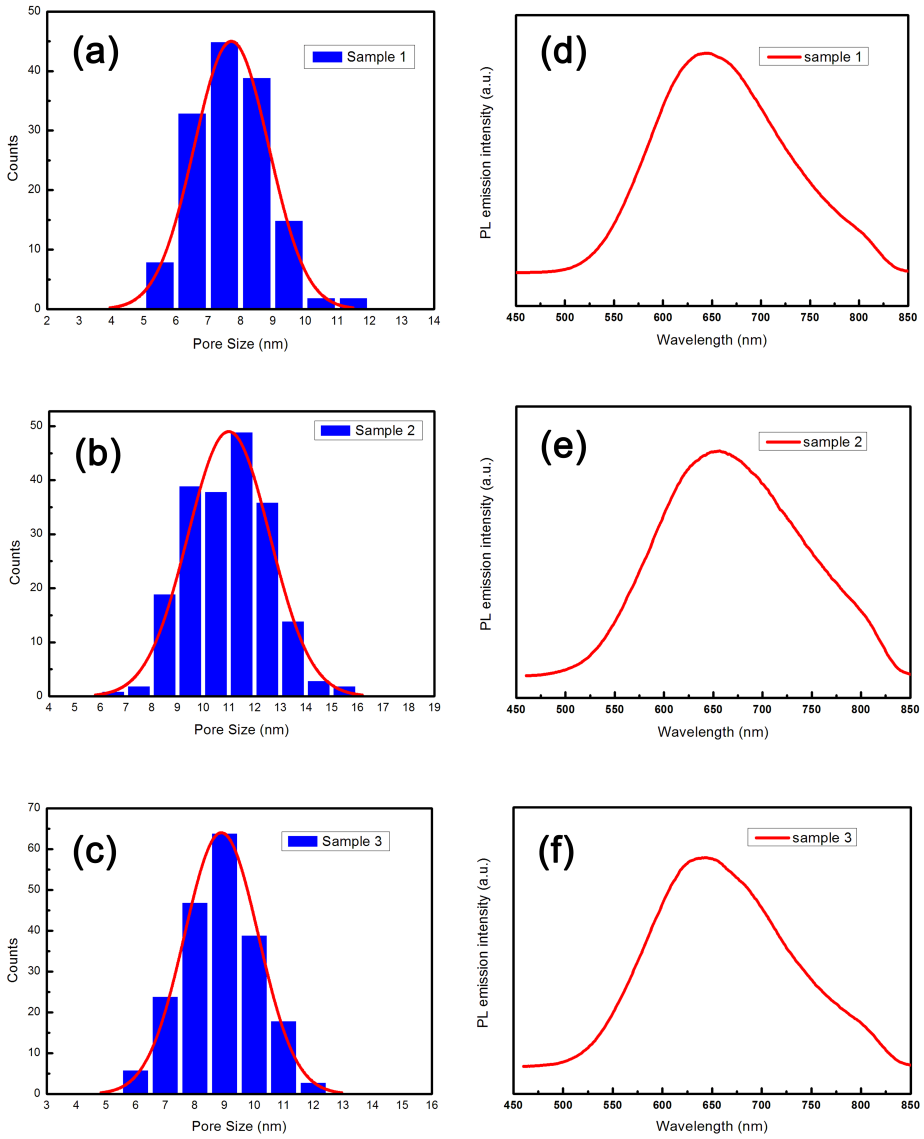

Fig. S1 The histograms of pore size distributions (a)-(c) and PL spectra (d)-(f) of three porous silicon nanowires.

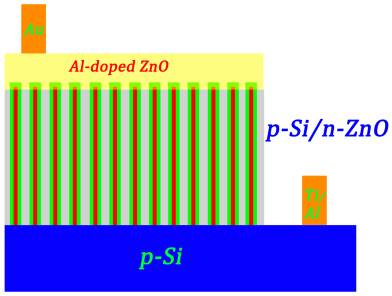

Fig. S2 A diagram of general Si/ZnO nanowire heterojunction LED.

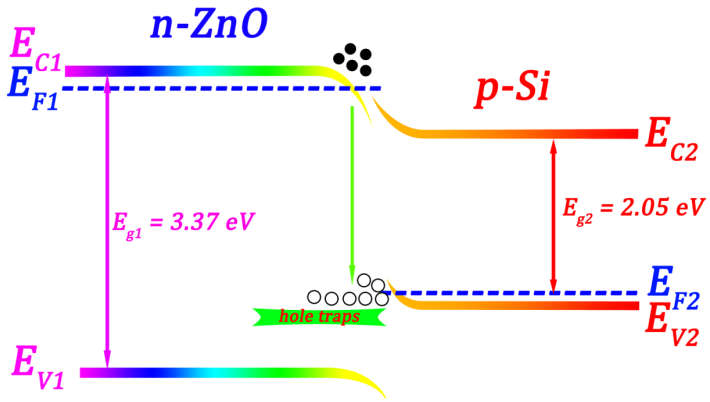

Fig. S3 Energy band diagram of porous Si/ZnO nanowires at forward bias.

As the Si/ZnO energy band diagram shown in Figure S3, because of larger electron affinity of ZnO, the conduction band minimum in silicon is 0.30 eV larger than that of ZnO, and excess electrons are injected into Si when silicon is in contact with ZnO at forward bias. The valence band maximum of ZnO is much lower than that of silicon, which hinders the injection of holes in Si into ZnO. However, the deep trap states in ZnO band gap are close to the valence band maximum of porous silicon, which favors the holes tunneling. Therefore, such device is possible to emit green (from ZnO) and red (from Si) light simultaneously to build the broad white light emission band.