Synthesis of highly emissive Mn-doped ZnSe nanocrystals without pyrophoric reagents

**Figure 1S** Large sized MnSe nanoclusters and PL/UV-Vis spectra of the resulting Mn:ZnSe d-dots.

Large sized MnSe nanoclusters were fabricated using the typical synthesis strategy by extending the growth time of MnSe nanoclusters at 260 °C. Seen for TEM image, the size is about 4 nm (growth time is about 40 min). The overcoating temperature of ZnSe was 240 °C using 0.5 mL of 0.2 M ZnSt₂ as Zn precursor (ZnSt₂:HSt=1:4). UV-Vis and PL spectra were taken at 50 min after the injection of Zn precursor.

**Figure 2S** Normalized PL intensity of Mn:ZnSe d-dots verses the reaction time of the MnSe at 260 °C.

The formation conditions of MnSe nanoclusters were the same with the typical synthesis except the different growth times for the MnSe nanoclusters. The overcoating temperature of ZnSe was 240 °C using 0.5 mL of 0.2 M ZnSt₂ as Zn precursor (ZnSt₂:HSt=1:4). PL spectras were taken at 50 min after the injection of Zn precursor and PL intensity was normalized to the same absorbance at the excitation wavelength.
**Figure 3S** Temporal evolution of PL intensity of Mn:ZnSe d-dots using different ZnSe overcoating temperature schemes.

Formation conditions of the MnSe nanoclusters were the same as the typical synthesis strategy. Blue curve: the reaction was kept at 260 °C at all times. Red curve: the reaction was rapidly cooled down to 220 °C from 260 °C within 30 seconds. PL of d-dots was monitored by taking aliquots and measuring their PL spectra at room temperature. PL intensity was normalized to the same absorbance at the excitation wavelength.

**Figure 4S** UV-Vis and PL spectra using a two-injection mode (top) and the corresponding TEM images (bottom).

UV-Vis and PL spectras were taken at 50 min after the every injection of the Zn precursor Solution. The overcoating temperature of ZnSe was 240 °C using 0.5 mL of 0.2 M ZnSt$_2$ as the Zn precursor (ZnSt$_2$:HSt=1:4).