Electronic Supplementary Information (ESI)

Phosphine-Free Synthesis of ZnSe:Mn^{2+} and ZnSe:Mn^{2+}/ZnS Doped Quantum Dots Using New Se and S Precursors

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1. Infrared (IR) spectroscopy of Mn precursor

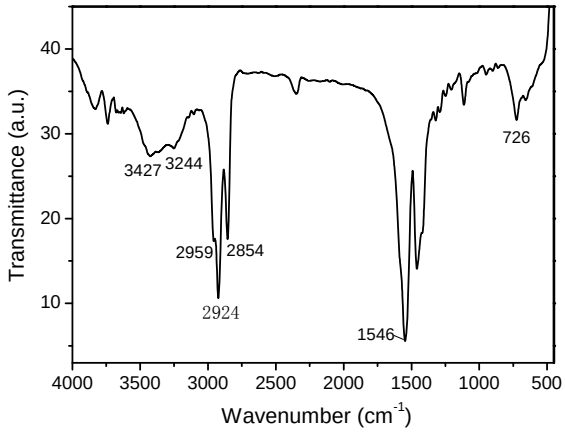

Fig. S1 IR spectrum of Mn precursor

IR spectrum of the used Mn precursor has been acquired on a Nicolet 360E.FP Fourier transform infrared spectrophotometer and further shown in Fig. S1. There are three strong vibration peaks at 2959, 2924 and 2854 cm^{-1}, respectively, from the asymmetry and symmetrical C—H stretching vibration, indicating the presence of CH_3 and CH_2 group in the Mn precursor. Also the Mn precursor is a carboxylic acid salt, which is indicated by a strong carbonyl vibration absorption peak at the 1546 cm^{-1}. So, the above results illustrate the presence of the bonding between nonanoic

acid and Mn^{2+} according to the preparation conditions of Mn precursor.

2. Elemental analysis of Mn precursor

Found from Mn precursor: C, 58.34%; H, 9.39%.

Calculated from manganese nonanoate $Mn(NA)_2$,: C, 58.52%; H, 9.28%.

The measured results from Mn precursor is very close to the calculated value from $Mn(NA)_2$.

3. Thermal gravimetric analysis of Mn precursor

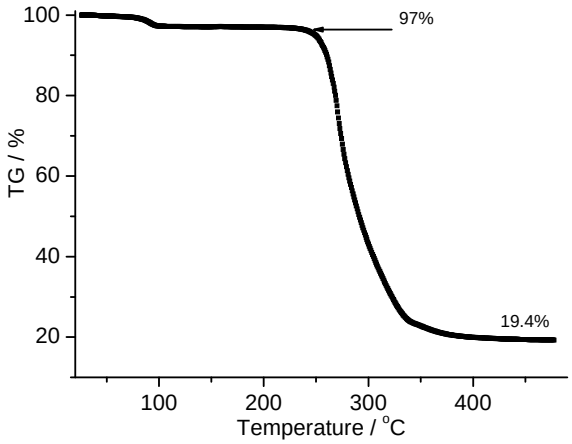

Fig. S2 Thermal gravimetric curve of Mn precursor

Fig. S2 shows the thermal gravimetric curve of Mn precursor from 25 to 475 °C. There are two obvious weightlessness platform: one in the range of 80-101 °C due to the lost of adsorbed water and then continuous weightlessness from 245 °C to about 350 °C. The final residue was approximately 19%, in good agreement with the theortical Mn content (19.2 %) based on MnO as the residue of manganese nonanoate.

4. Conclusion

According to the above reuslts from infrared spectroscopy, elemental analysis and thermal gravimetric analysis, it is believed that the manganese precursor is manganese nonanoate [$Mn(NA)_2$]. In addition, the excess of nonanoic acid relative to Mn^{2+} used in the reaction (the ratio of nonanoic acid to Mn^{2+} is 3) favors the complete replacement of acetate with nonanoate to form $Mn(NA)_2$. The preparation reaction of Mn precursor can be represented by the following formula:

$MnAc_2 + 2\ CH_3(CH_2)_7COOH \rightarrow (CH_3(CH_2)_7COO)_2Mn.$