

## Supporting information

### **Mutual connection between extinction and morphology revealing growth evolution of Janus Mn:Ag<sub>2</sub>Se-Au nanostructures**

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S3 Normalized PL spectra of Mn:Ag<sub>2</sub>Se-Au and background signal under 415-nm laser excitation. The spectral lineshape of Mn:Ag<sub>2</sub>Se-Au, with an emission at around 600 nm, is very different from background signal.

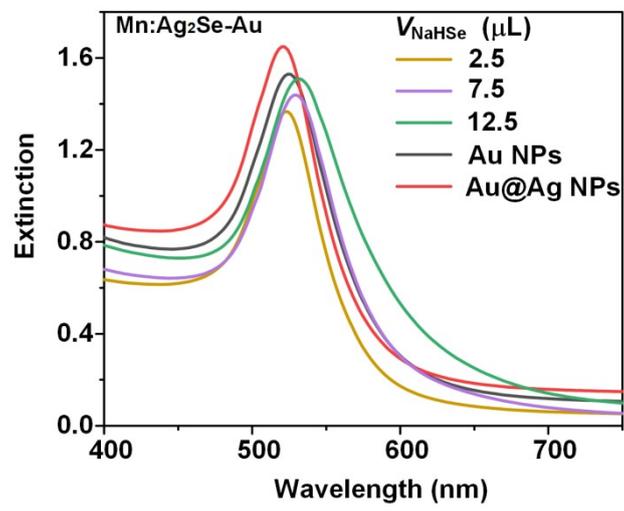


Figure S1. Extinction spectra of the samples with  $\text{NaSe}_2\text{O}_3$  as Se source. There is a tiny SPR redshift after growth, indicating that the size of grown part is small.

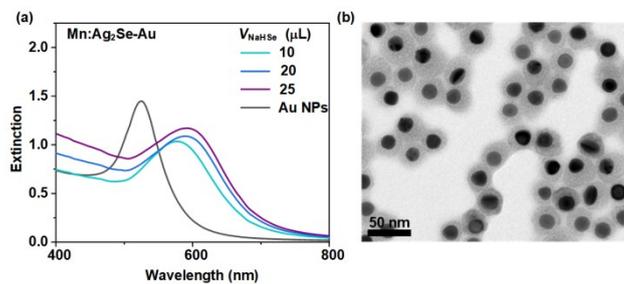


Figure S2. (a) Extinction spectra and (b) TEM image of the samples without Ag intermediate layer, and with NaSe<sub>2</sub>O<sub>3</sub> as Se source. The intense extinction at around 585 nm and the thick Se shell are similar with that shown in Figure 3.

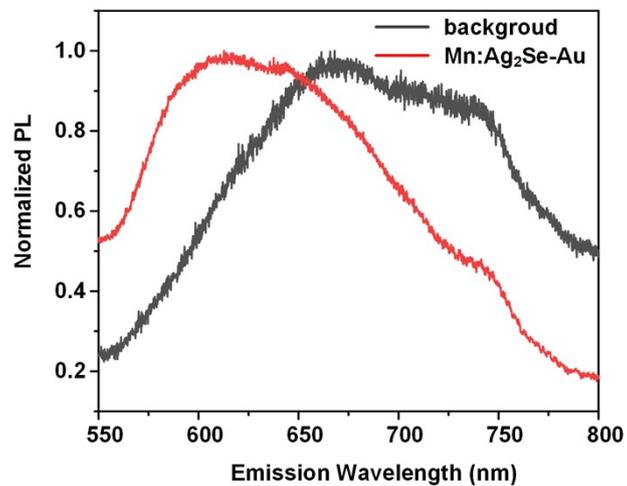


Figure S3. Normalized PL spectra of Mn:Ag<sub>2</sub>Se-Au and background signal under 415-nm laser excitation. The spectral lineshape of Mn:Ag<sub>2</sub>Se-Au, with an emission at around 600 nm, is very different from background signal.