**Fig. S1** XPS analysis of the Fe$_3$O$_4$ purchased from Aladdin Co. Ltd.

**Fig. S2** SEM images and XRD pattern of the FeS$_2$ NCs prepared from nano-Fe$_3$O$_4$ without 1-octylamine.
Fig. S3 FeS$_2$ NCs synthesized from Fe(acac)$_3$ with different amount of 1-octylamine (a) 0.5 mL, (b) 2 mL, (c) 4 mL, (d) 8 mL.
**Fig. S4** XRD patterns of the FeS$_2$ NCs synthesized from Fe(acac)$_3$ with different reaction time. (a) 0.5h, (b) 1h, (c) 3h, (d) 6h, (e) 12h, (f) 24h.
**Fig. S5** SEM images of the FeS$_2$ NCs synthesized from Fe(acac)$_3$ with different reaction time. (a) 0.5h, (b) 1h, (c) 3h, (d) 6h, (e) 12h, (f) 24h.
**Fig. S6** Magnetic hysteresis curves of the nano-Fe₃O₄ measured at 5 K and 300 K.

**Fig. S7** XRD patterns of the FeS₂ NCs prepared from nano-Fe₃O₄ with different reaction time.