Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

A multiple emission bands NIR persistent luminescence nanoparticles $mSiO_2@Zn_{0.6}Ca_{0.4}Ga_2O_4$: Cr^{3+}, Yb^{3+} for biological applications

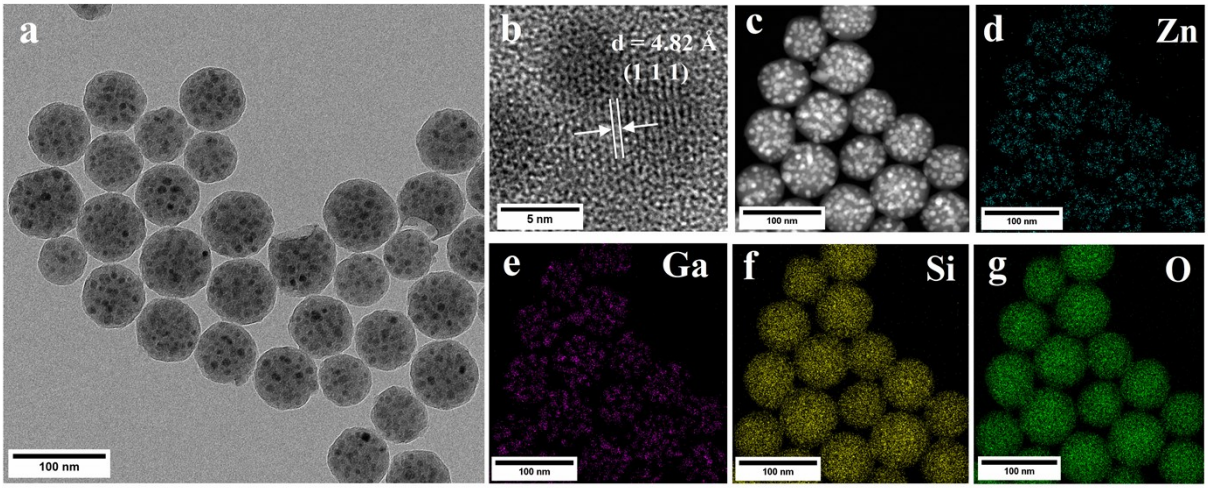

Figure S1 (a) TEM image of $mSiO_2$@ZGO nanocrystals. (b) HRTEM image of $mSiO_2$@ZGO nanocrystals. (c) High angle annular dark field scanning transmission electron microscopy (HAADF-STEM) image and (d–g) HAADF-STEM-EDS mapping images of $mSiO_2$@ZGO nanocrystals.

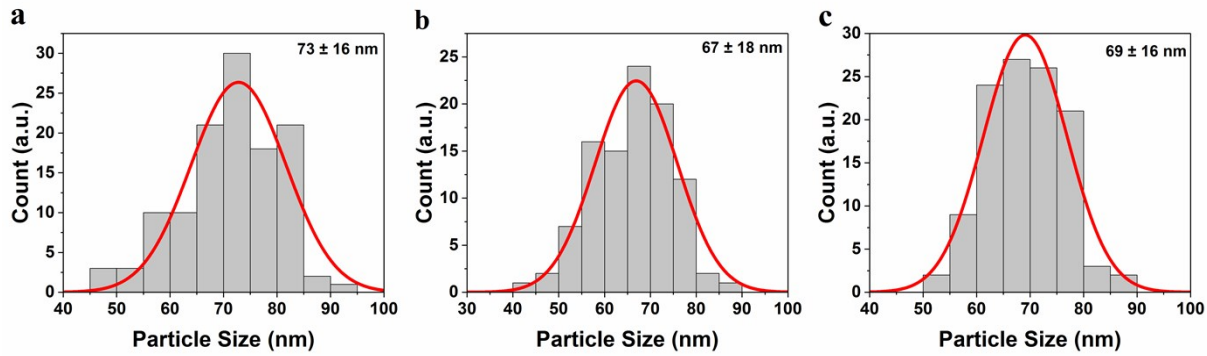

Figure S2 Size distribution of the as-synthesized (a) $mSiO_2$, (b) $mSiO_2$@ZGO and (c) $mSiO_2$@ZCGO nanocrystals, which was obtained by calculating 100 particles in the TEM images.

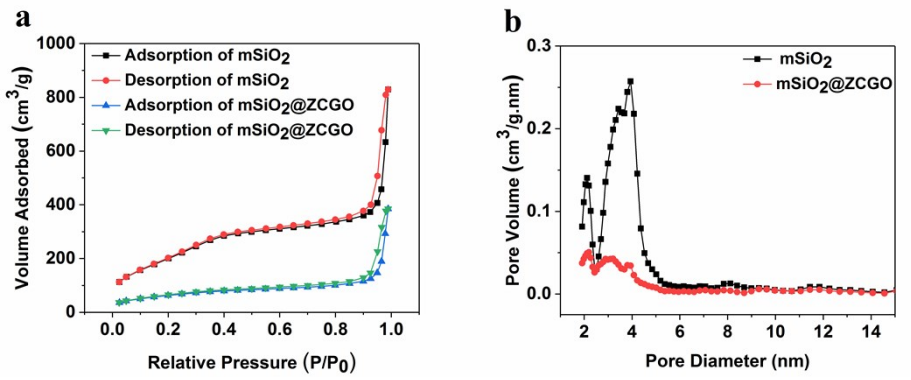

Figure S3 (a) N_2 adsorption/desorption isotherms and (b) pore size distributions of $mSiO_2$ and $mSiO_2$@ZCGO nanocrystals, respectively.

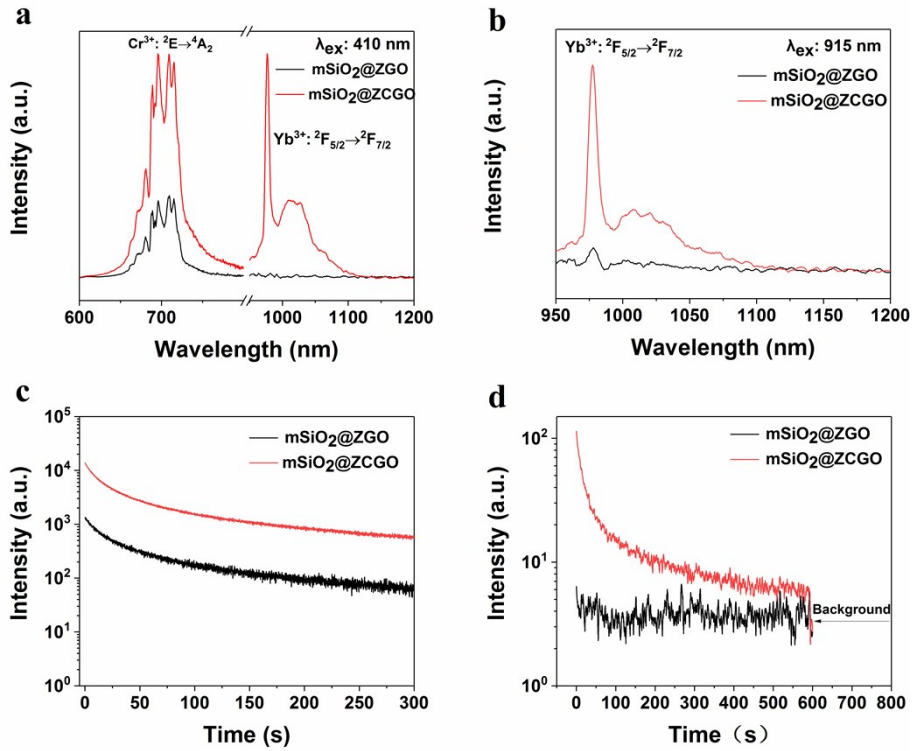

Figure S4 (a) Photoluminescence (PL) spectra measured by excitation at 410 nm for $mSiO_2$@ZGO and $mSiO_2$@ZCGO nanocrystals, respectively. (b) PL spectra measured by excitation at 915 nm for $mSiO_2$@ZGO and $mSiO_2$@ZCGO nanocrystals, respectively. Persistent luminescence decay curves measured by monitoring the emissions at (c) 696 nm and (d) 977 nm of $mSiO_2$@ZGO and $mSiO_2$@ZCGO nanocrystals after being illuminated with a 254-nm UV lamp for 1 min and 10 min, respectively.

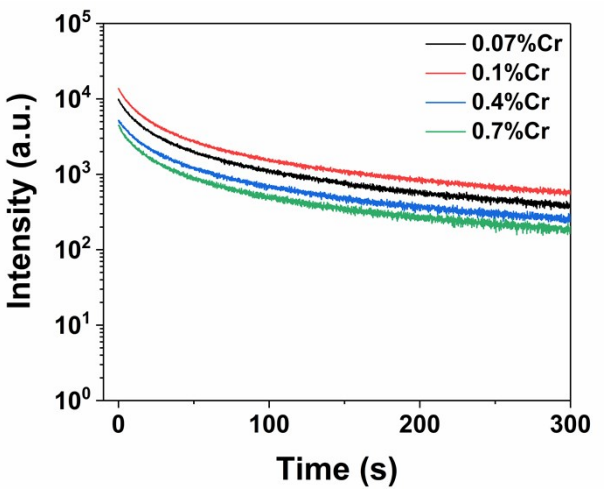

Figure S5 Persistent luminescence decay curves measured by monitoring the emission at 696 nm of $mSiO_2$@ZCGO nanocrystals with various contents of Cr^{3+} ions (0.07 - 0.7 % mol) after being illuminated with a 254-nm UV lamp for 1 min.

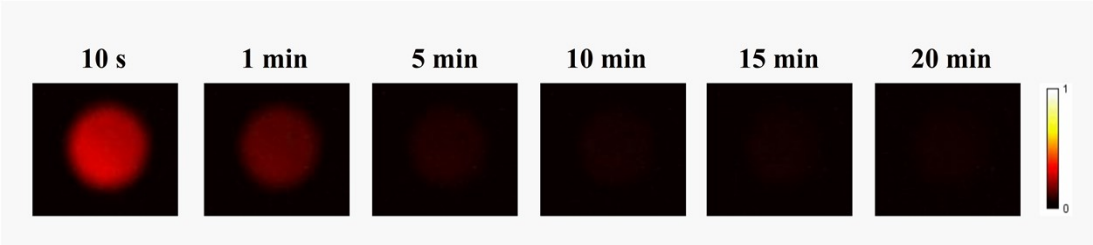

Figure S6 Yb^{3+} ions persistent luminescence images of $mSiO_2$@ZCGO nanocrystals recorded at different delayed time by an InGaAs camera after the sample has been illuminated with a 254-nm UV lamp for 10 min. The exposure time of the InGaAs camera is 1s.