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Supplementary Information

Colloidal Silicon Germanium Alloy Nanocrystals with High Boron and Phosphorus Concentration Hydrophilic Shell

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Ge composition dependence of Raman Si−Si peak

Fig. S1 shows the wavenumber of the Si−Si Raman peak of B and P codoped $Si_{1-x}Ge_x$ NCs as a function of Ge composition. The dashed line represents the relation between the peak wavenumber ($\omega_{Si-Si}(x)$) and Ge composition (x), $\omega_{Si-Si}(x) = 520.2 - 62x$, obtained for $Si_{1-x}Ge_x$ alloy crystal (J. C. Tsang, P. M. Mooney, F. Dacol and J. O. Chu, *J. Appl. Phys.*, 1994, **75**, 8098-8108.).

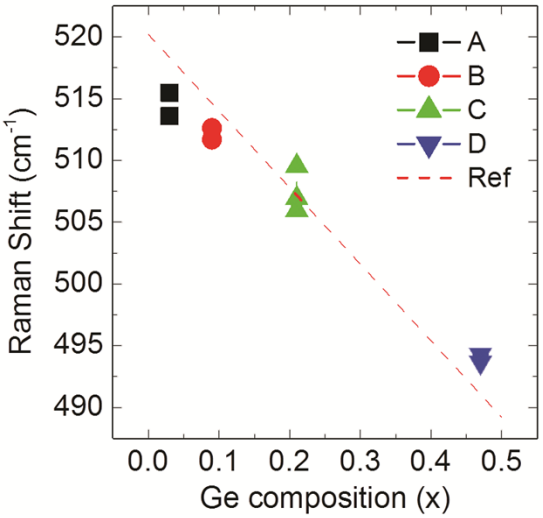

Fig. S1 Wavenumber of Si−Si Raman peak of B and P codoped $Si_{1-x}Ge_x$ NCs as a function of Ge composition.

Per-atom absorption cross-sections

Fig. S2 shows per-atom absorption cross-sections, σ_{atm}, calculated from transmission spectra of $Si_{1-x}Ge_x$ NCs dispersed in methanol. σ_{atm} is defined by the Beer-Lambert law

$$T = \frac{I}{I_0} = e^{-Nl\sigma_{atm}} \quad (1)$$

where T is the transmission, I and I_0 are the final and initial intensities, N is the NC atomic number density and l is the path length. N was calculated from the colloid concentration by ICP-AES.

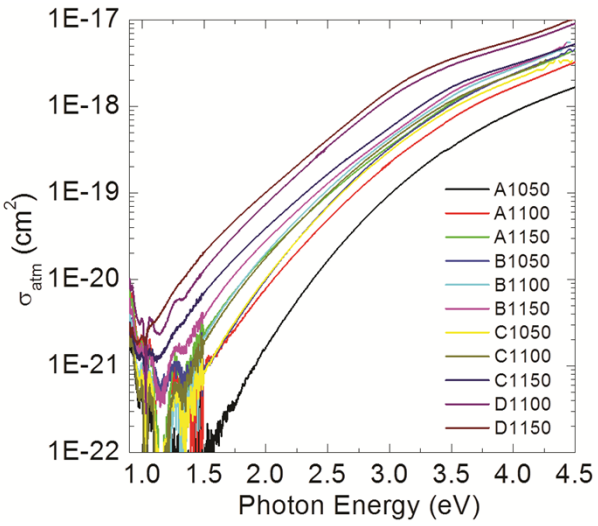

Fig. S2 Per-atom absorption cross-section spectra of B and P codoped $Si_{1-x}Ge_x$ NC samples.

PL properties

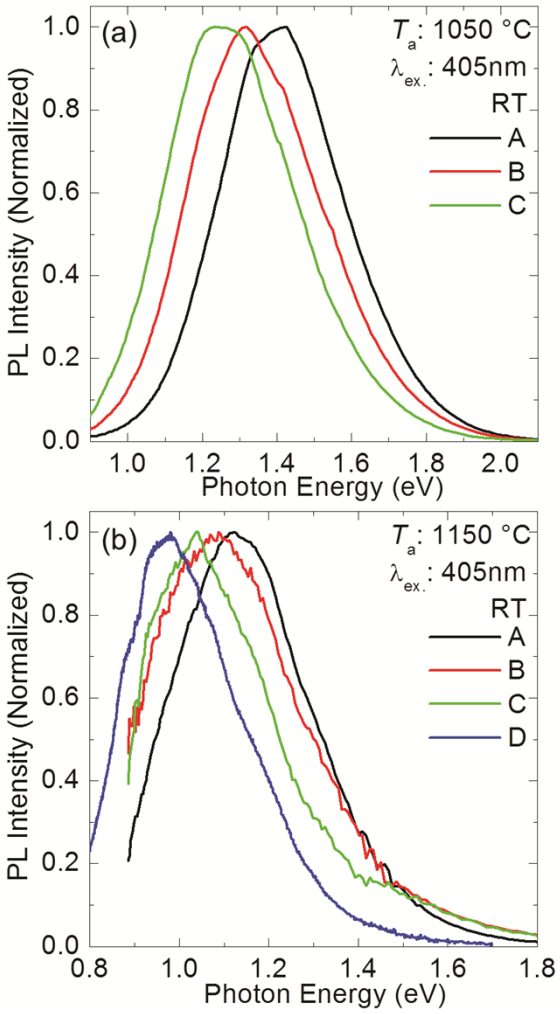

Fig. S3 Normalized PL spectra of B and P codoped $Si_{1-x}Ge_x$ NCs. Annealing temperature T_a = (a) 1050°C, (b) 1150°C.