Intensity enhancement of RGB-light-emitting Si nanocrystals by gold nanoparticles

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We have performed the pulsed laser ablation of solid materials in a supercritical fluid to generate silicon (Si) and gold (Au) nanoparticles [1-4]. In the previous studies, we succeeded in generating RGB-light-emitting Si nanocrystals (Fig. a) [2] and Au nanoparticles [3], having a great enhancement factor of surface-enhanced Raman scattering (SERS).

In the present study, we conducted the photoluminescence spectral measurements of Si nanocrystals upon the excitation of the Au nanoparticles. As a result, we found the photoluminescence (PL) intensity enhancement of Si nanocrystals due to the localized surface plasmon resonance of Au nanoparticles (Fig. b). In particular, the significant enhancement was obtained when the Medusa-type Au nanoparticle (Fig. c) was used; i.e. Enhancement Factor is ranging from 10^4 to 10^5. This means that the localized surface plasmon of Au nanoparticles enhances the PL intensity of Si nanocrystals from 10^4 to 10^5 times.

References

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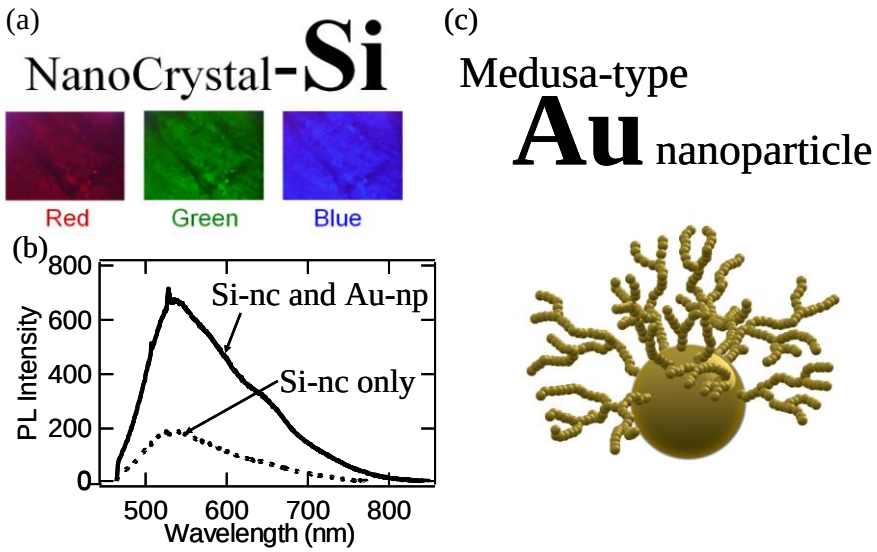

(a) Photoluminescence images measured with a fluorescence microscope at the excitation wavelength of 375 nm. (b) Photoluminescence spectra at the excitation wavelength of 458 nm. Solid and dashed lines are photoluminescence spectra of Si nanocrystals with and without Au nanoparticles, respectively. (c) Morphology of Au nanoparticle. We call its structure a Medusa-type Au nanoparticle.