Supporting information

One-pot facile synthesis of concentrated Si nanoparticles solution

Hua Sun[a], Satoshi Miyazaki[a], Hironori Tamamitsu[a], and Ken-ichi Saitow*[a,b]

[a]Department of chemistry, Graduate school of science, Hiroshima University, 1 3 1 Kagamiyama, Higashi Hiroshima, Hiroshima 739 0046, JAPAN.

[b]Natural science center for Basic R&D (N-BARD), Hiroshima University, 1 3 1 Kagamiyama, Higashi Hiroshima, Hiroshima 739 0046, JAPAN.

1. Measurements of electron microscope

The morphology and surface structure of Si particles before and after milling was observed, using a field emission scanning electron microscope (FE-SEM: S-5200, Hitachi Technologies Co.). The FE-SEM samples were prepared by dropping a dispersed solution of Si nanoparticles on a carbon tape. The morphology and surface structure of Si particles was also investigated by measuring transmission electron microscope (TEM: JEM-2011, JEOL) images at the acceleration voltage of 200 kV. The TEM samples were prepared by dropping a Si-QD solution on TEM grids (High Resolution Carbon Grid STEM Cu100P, Okenshoji Co., Ltd.).

2. Measurements of fluorescence intensity enhancement

To evaluate the Si nanoparticle solution, from an application point of view, the

enhancement effect on the fluorescence intensity was investigated by measuring the fluorescence spectra of dye solution. The enhancement substrate was prepared by dropping a dispersed solution of Si nanoparticles onto a fluorescence-free quartz plate. The fluorescence dye solution was prepared by dissolving crystal violet (CV) into water, i.e. concentration is 3.6 x 10^{-5}M. The fluorescence spectra of CV solution were measured by *in situ* photoluminescence microscopy (Horiba Jobin Yvon, HR800) at the excitation wavelength of 632.8 nm with a He-Ne laser. The laser power was set to 17 μW in front of an optical cell. The enhancement substrate was immersed in the CV solution of optical cell and the solution in the cell was sealed by a cover glass. Using an objective lens (SLMPLN100x; Olympus) with a long working distance (7.6 mm), the fluorescence spectra under the cover glass were measured. The fluorescence spectra with and without the enhancement substrate were measured and used to estimate the enhancement factor (EF). Namely, the EF of the fluorescence intensity of CV solution was obtained by calculating the ratio, $I_{with}/I_{without}$, where I_{with} and $I_{without}$ represent the fluorescence intensities of CV solution with and without the enhancement substrate, respectively. In addition, the enhancement factor was calibrated by subtracting background signals of the enhancement substrate and solvent from the CV solutions.

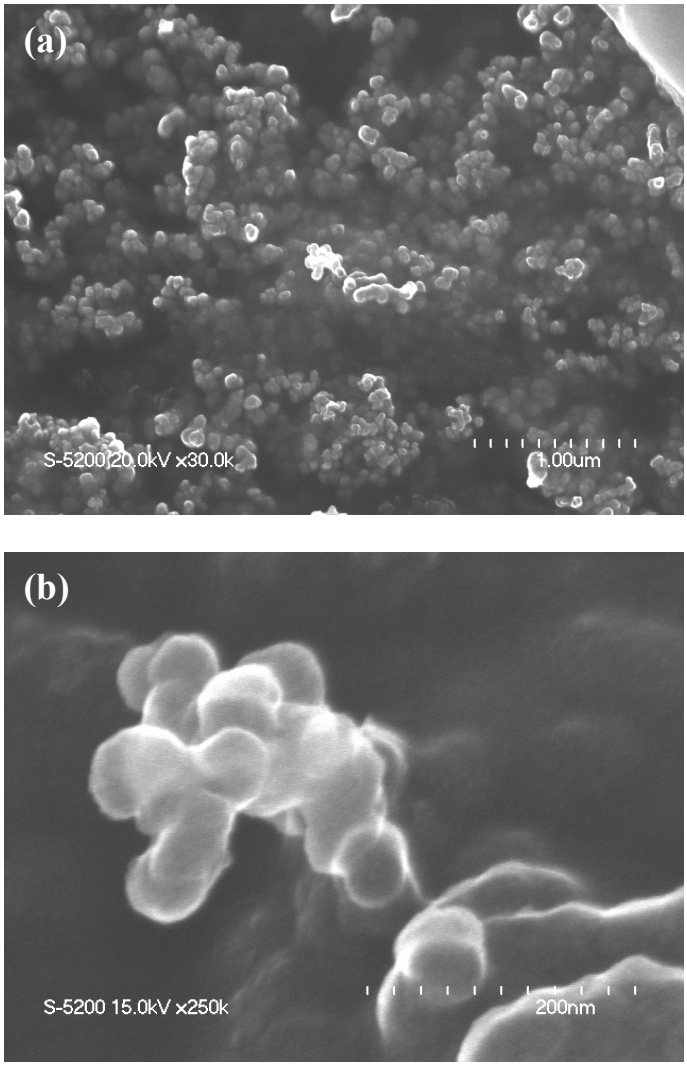

Figure S1. FE-SEM images: (a) Si-NPs generated by milling in 2-propanol. Milling time and revolution speed are 18 hours and 500 rpm, respectively. (b) magnified image of (a).

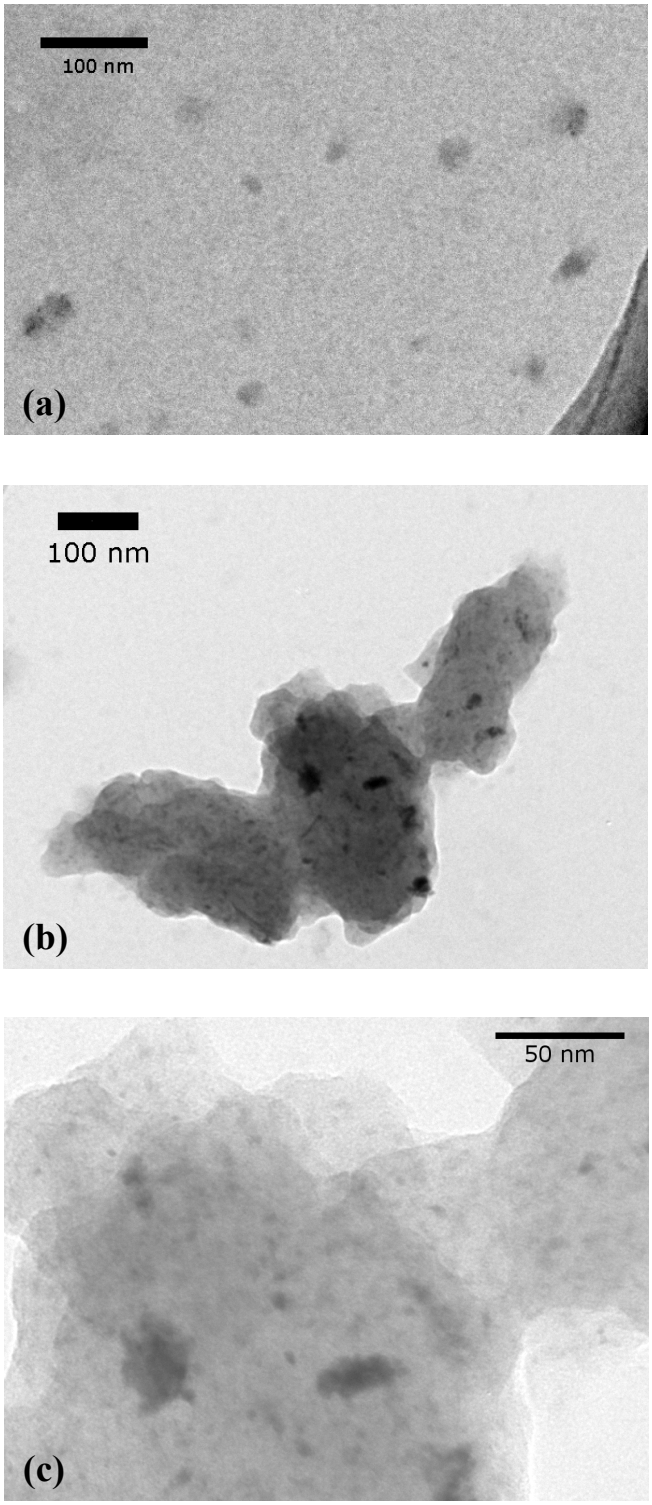

Figure S2. TEM images: (a) single Si-NPs. The sample for TEM measurement is prepared by 400 times dilution from the original Si-NPs solution. (b) aggregated particles. (c) magnified image of (b). The particles in TEM images are generated by milling in 2-propanol. Milling time and revolution speed are 18 hours and 500rpm, respectively. It seems that the black and grey regions correspond to the crystalline and amorphous phases, respectively.

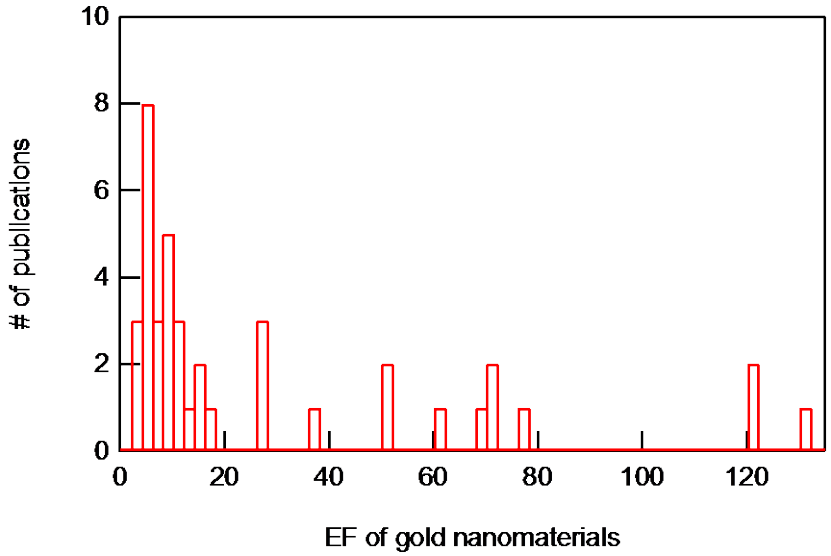

Figure S3. Histogram of the number (#) of papers for the fluorescence intensity enhancement (EF) using gold nanomaterials. The relation between the number vs EF is obtained from the data base of the SCI finder scholar, using keyword “enhancement of fluorescence or luminescence”, “plasmon”, “gold, and "enhancement factor”. This figure is produced from the data from the last 5 years.