

Supporting Information

All-Inorganic Water-Dispersible Silicon Quantum Dots: Highly Efficient Near-Infrared Luminescence in a Wide pH Range

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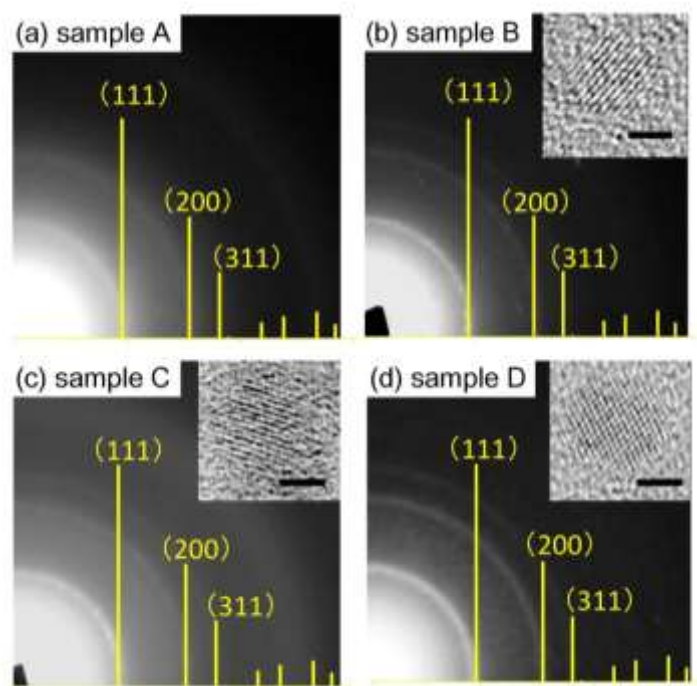


Figure S1. (a)-(d) Electron diffraction patterns of samples A-D. The diffraction rings agree with that of Si crystal with the diamond structure (JCPDS No. 27-1402)

Inset: High-resolution TEM images of codoped Si-QDs (sample B-D) on carbon coated TEM meshes. The scale bar is 2 nm. The lattice fringes correspond to {111} planes of Si. The background amorphous image is from a carbon thin film.

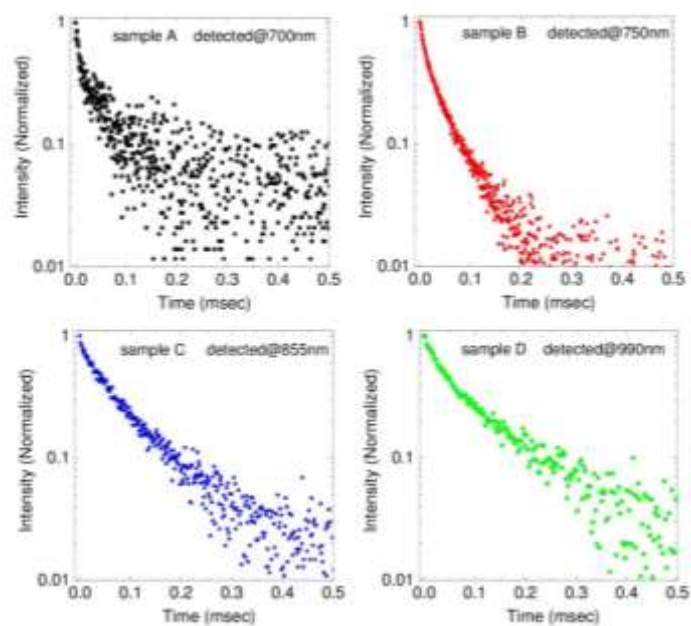


Figure S2. PL decay curves of samples A-D detected at the PL maxima.

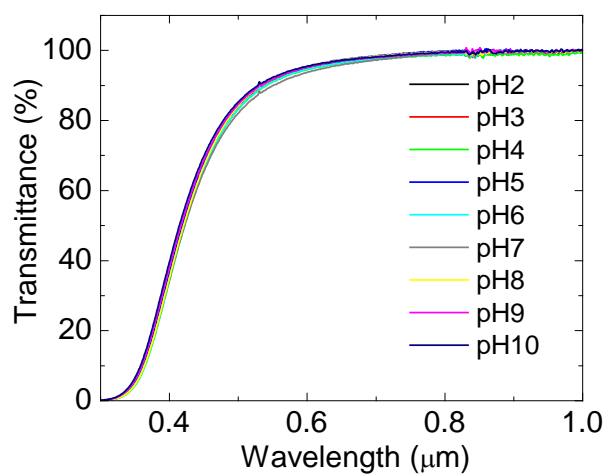


Figure S3. Optical transmittance spectra of sample D in water with different pH.

Before conducting the present research, we performed the following experiments as a part of feasibility studies. After removing BPSG matrices by HF solution etching, we exchanged HF solution with different kinds of solutions, i.e., dispersed QDs in different kinds of solutions. The photos of the solutions are shown in Fig. S4. The solutions are ethanol, methanol, water and the mixture of methanol and water. Precipitates are removed by centrifugation. In Fig. S4, we can clearly see that the amount of QDs dispersible in solution depends strongly on a kind of solution. The QD concentration in water is less than 10 % of that in methanol. Therefore, we tried to develop a method to disperse a larger amount of Si-QDs in water. The method is first to disperse Si-QDs in methanol and then exchange methanol to water by using a *centrifugal filter*. With this process, we succeeded in dispersing almost the same amount of Si-QDs in water as that in methanol.

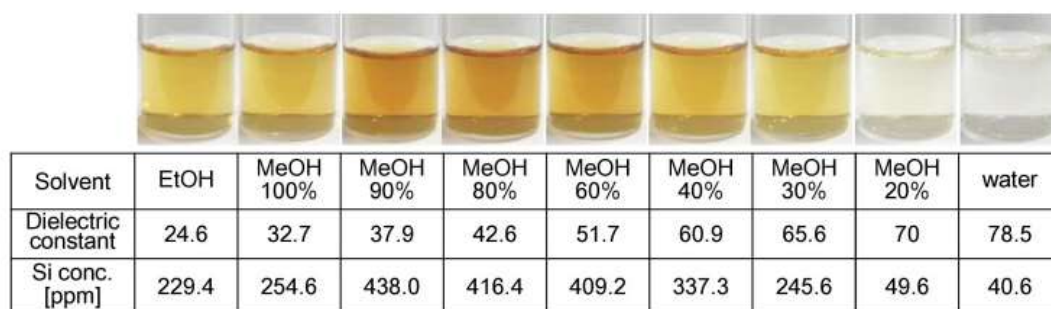


Figure S4. Photographs of codoped Si-QDs dispersed in ethanol and the mixtures of water and methanol. Dielectric constants and Si concentrations are shown below the figure.