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Photoluminescence properties of silicon quantum dots preared by plasma-enhanced chemical vapor deposition

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The silicon-based luminescent material has attracted great attentions in recent years. The indirect nature of the silicon band structure prevents the efficient light emission as a result of small radiative dipole transition possibilities. Methods for overcoming indirect bandgap limitations in silicon have been proposed. These methods involve Brillouin zone folding in thin superlattics, band structure engineering via alloying and nanostructures. Among the method, the formation of zero dimensional structure that breaking of the momentum conservation law and enabling strong radiative recombination is one of the most promising methods to the achieve stable light emission[1,2]

In this work, we attempted to determine the optimum a-Si quantum dot growth condition on SiNx matrix by PECVD as a function of gas ratio which affect the density and distribution of Si-QDs to be controlled. The analytical tools uesd to charactersize of the a-Si-QDs such asphotoluminescence (PL), raman spectroscopy, fourier transform infrared (FTIR), transmission electron microscope (TEM). From these techniques, luminescence spectra, composition properties and dot size were observed in the Si nanostructures.