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## Visible photoluminescence from nanocrystal-Si in SiN<sub>x</sub> thin films grown by ion beam sputtering

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Since the first report by Canham(1), luminescence by Si nanostructures has been important as a subject of research. Although the luminescence properties of Si nanocrystals are determined by quantum confinement effect, it has proven to be difficult to obtain blue luminescence from oxide-passivated nanocrystal-Si (nc-Si). On the other hand, nanoclusters in other dielectrics such as SiN<sub>x</sub> have been reported to be a promising source for blue luminescence (2,3).

In this work, we will report tunable red-green-blue luminescence from nc-Si in SiN<sub>x</sub> films grown by ultra-high vacuum ion beam sputter deposition. After deposition, these films were annealed for 10 min at 950°C in order to induce nucleation and growth of nc-Si and hydrogenated for 1 hour at 650°C in flowing H<sub>2</sub> forming gas to passivate defects. We confirmed the presence of 1-2 nm nc-Si in SiN<sub>x</sub> from HR-TEM image. The room temperature PL spectra of SiN<sub>x</sub> films show strong luminescence in full range that can be tuned by varying the excess Si content of the films. This result is consistent with quantum confinement effect with decreased excess Si content. Comparison of PL energy of SiN<sub>x</sub> with that of SiO<sub>x</sub> having similar excess Si content shows a blue-shift, which is consistent with the other results by the interface control of nc-Si. The possibility of SiN<sub>x</sub> film to realize full-color light emitting device will be also presented.

[참고문헌]

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