
Nanocrystal Si sensitization of Er³⁺ luminescence

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Er³⁺ luminescent mechanism from Er doped silicon-rich silicon oxide (SRSO)⁽¹⁾ and silicon-rich silicon nitride (SRSN) grown by ultra-high vacuum (UHV) ion sputter deposition is investigated. The compositions of film are controlled by *in-situ* x-ray photoelectron spectroscopy (XPS) and calibrated by Rutherford back scattering (RBS).

After deposition, the films are annealed at 300-1100 °C to form the nanocrystal Si (nc-Si) and hydrogenated at 650 °C in forming gas to passivate defects.

We find that nc-Si in SRSN or SRSO act as efficient sensitizers for Er³⁺, showing the strong energy transfer from nc-Si to Er³⁺ ions and the suppression of temperature quenching is also more efficient than that of pure oxide or nitride, indicating the high Er³⁺ luminescence. At the optimum condition of 950 °C anneal, Er³⁺ luminescence from SRSN is nearly same as that of SRSO.

These results imply that Er doped SRSN can be a promising alternative to Er doped SRSO for Si based photonic applications.

[참고문헌]

1. M. Fujii, "Evidence for energy transfer from Si nanocrystals to Er³⁺." Appl. Phys. Lett. 71, 1198 (1997).