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Luminescent periodic microstructures for medical applications

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Various works on silicon (Si)-based luminescent materials (such as Si nanocrystal (Si-nc)) utilizing the quantum confinement effect has been reported. A typical fabrication method of Si-ncs is co-sputtering of Si and SiO_2. Blue-, red-, white-, and near-infrared-light emissions were observed from such co-sputtered films. However, emission efficiencies of such Si-based luminescent materials remain low. In particular, extraction efficiencies seem to be very low because of the total reflections at their surfaces. Integrating periodic microstructures on light-emitting diodes (LEDs) is one way of achieving high extraction efficiency. It was also reported that two-dimensional (2-D) periodic microstructures can effectively extract the light emitted from active layers of LEDs according to diffraction laws. This paper will demonstrate 2-D periodic microstructures composed of Si-based luminescent thin films by using co-sputtering Si and SiO_2, simple double-interference exposure, and plasma etching. An enhanced photoluminescence peak around a wavelength of 800 nm observed from a luminescent periodic microstructure will be presented. Because Si-based materials have biocompatibility and the transmittance of a human body at the wavelength 800 nm, I believe that Si-based light-emitting devices for medical applications can be realized by utilizing our technologies. Details will be presented at the conference.

Biography

Kenta Miura received his BE degree in Communication Engineering (1998), and his ME (2000) and PhD (2003) degrees in Electronic and Communication Engineering from Tohoku University, Sendai, Japan. He joined the Japan Science and Technology Agency as a Researcher in 2003. He moved to Gunma University, Kiryu, Japan as a Research Associate in 2004 and became an Assistant Professor in 2007. Since 2010, he has been an Associate Professor of Gunma University. His current research interests are light-emitting materials produced using sputtering and their device applications.

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