

Modified spontaneous emission from rare earth ion doped titania photonic crystals

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Rare earth ion doped semiconductor exhibits sharp photoluminescence (PL) originated from 4f shell transition at visible and IR region and these materials have advantages in light emitting diodes displays, lasers and optic amplifiers. Emission of light generated by rare earth ion doped semiconductor can be modified in photonic crystals since the refractive index varies depending on the length scale of the order of the wavelength. By using rare earth ion doped semiconductor as photonic band gap materials, controlling spontaneously emitted light could be achieved.

In this presentation, we fabricate Er³⁺ or Eu³⁺ doped titania inverse opals by infiltrating opals with chemical solutions containing titanium precursors and rare earth ions. We also observe modified photoluminescence of rare earth doped titania inverse opals by changing length scales of the photonic crystals. Moreover, it will be described that rare earth ion doped titania photonic crystals have the potentials for optical devices.