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# Strong visible emission from porous GaP doped with Eu and Tb ions

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## Abstract

We demonstrate strong room-temperature photoluminescence (PL) in the visible region of the spectrum from europium (Eu3+)-doped porous GaP (por-GaP) layers. Eu3+ ions were infiltrated into the host matrix by simple impregnation from chloride solution of europium, followed by high temperature annealing in air. From RBS analysis, a rather uniform incorporation of Eu3+ ions over the porous layer has been evidenced. A systematic study of the PL spectrum versus annealing temperature was performed. It was found that the Eu3+ ions in GaP crystallites are optically activated after annealing at 900°C. The excitation mechanism of Eu3+ in por-GaP is discussed taking into account the dependence on the excitation beam wavelength of PL and the evolution of both the PL intensity and the PL lifetime versus temperature. The PL decay shows a non-exponential behaviour due to multisite phenomena or other processes like resonant and non-resonant energy transfer. The insignificant dependence of the PL intensity and the PL life time on temperature suggests a weak back transfer process from Eu to the host. A schematic band diagram is proposed to illustrate the excitation mechanism at low and high temperature. The PL intensity of Eu3+ ions was found to be strongly enhanced by co-doping por-GaP with Eu3+ and Tb3+. We show that excitation transfer can occur between Tb3+ and Eu3+.