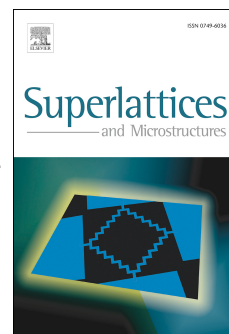


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Down-shifting emission by charge transfer band in porous silicon infiltrated with Eu^{3+} and Gd^{3+} ions

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Abstract

Down-shifting emission properties of europium (Eu^{3+}) and gadolinium (Gd^{3+}) ions incorporated in porous silicon (PS) layers are presented. Different samples were prepared by electrochemical etching of p^+ -type crystalline silicon wafers followed by simple impregnation with rare earth ions from nitrate solutions of europium and gadolinium and subsequent high temperature annealing in air. The samples exhibited room temperature photoluminescence (PL) and the excitation spectra present a wide excitation band around 233 nm which can be associated to the charge transfer band transitions. This band is attributed to $\text{O}^{2-}(2p) \rightarrow \text{Eu}^{3+}(4f)$ ligand-to-metal charge transfer. The down-shifting emission for $\text{Gd}^{3+}:\text{Eu}^{3+}$ was analyzed by a simple rate equation model to study the interaction between the O^{2-} ions and Eu^{3+} ions. The exact solution of this model agrees very well with the experimental results.

Keywords

Porous silicon, photoluminescence, europium, gadolinium

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