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## Spectroscopic studies of Er-doped Si-rich silicon oxide/SiO<sub>2</sub> multilayers

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Abstract

The effects of Si nanocluster (Si-nc) size and of the distance between Si-nc and Er ion on the photoluminescence of the Er<sup>3+</sup> ions have been investigated by means of appropriate multilayer configurations fabricated by reactive magnetron sputtering. On the one hand, the effect of Si-nc size is studied in Er-Si-rich SiO<sub>2</sub>/SiO<sub>2</sub> multilayers. The coupling between Si-nc and Er<sup>3+</sup> ions is found to be less efficient when the Si-nc's reach a size of 5 nm and attributed to a loss of the quantum confinement of carriers. On the other hand, the interaction distance between Si-nc and Er ions is determined through the photoluminescence properties of Si-rich SiO<sub>2</sub>/Er-SiO<sub>2</sub> multilayers. The characteristic interaction distance Si-nc-Er is dependent on the nature of the sensitizers with  $0.4 \pm 0.1$  nm for amorphous Si and  $2.6 \pm 0.4$  nm for Si nanocrystals.



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