# VISIBLE AND IR PHOTOLUMINESCENCE STUDY OF ERBIUM-DOPED SILICON NANOCRYSTALS PRODUCED BY RF SPUTTERING

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Since the discovery of the 'size effect' on the silicon band gap and the observation of room temperature photoluminescence (PL) in the visible range from porous silicon**,** the research on nanostructured silicon-based materials aimed at the fabrication of efficient optoelectronic integrated systems has been intensified.

Erbium-doping of nanostructured silicon allows such systems to emit in the infra-red region (1.54 μm that corresponds to the minimum in absorption within the transparent window of silica fibers) leading the way to the design of devices for optical communications.

In this paper, erbium-doped low dimensional Si-based heterogeneous matrices were grown by reactive magnetron sputtering on glass substrates using different oxygen/hydrogen ratios and showing different microstructures. Amorphous, micro- and nanocrystalline samples were obtained and their optical properties are shown to be dependent on the film crystalline fraction and matrix chemical composition. For the structural characterisation, X-ray in the grazing incidence geometry and Raman spectroscopy were used. The chemical studies were done using the RBS/ERD technique. Spectroscopic ellipsometry (SE) has been combined with the previous techniques to resolve the film microstructure and composition. In particular, the distribution along the film thickness of the volume fractions of nanocrystalline/amorphous silicon and $SiO_x$ phases has been obtained from SE analysis.

In this contribution visible photoluminescence from thin silicon films as a function of oxygen/ hydrogen ratio present in the matrix and the sample microstructure is discussed.

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