Studying the blue-violet photoluminescence from Sn implanted SiO_2 films using a two-step annealing process

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The blue-violet photoluminescence (PL) response of ion beam synthesized Sn nanoparticles (NPs) in silica is studied in samples submitted to a two-step thermal annealing process [1]. This process consists of a low temperature and longtime aging treatment followed by a high temperature and short time one [2]. The annealed samples were characterized by Rutherford backscattering spectrometry (RBS) and transmission electron microscopy (TEM). The results show that for non-aged control samples, the mean particle size increases as a function of temperature. In stark contrast, the TEM and RBS results show that the aging treatment causes the formation of a thermally stable and dense array of rather small Sn NPs. This phenomenon is correlated with the enhancement in the blue-violet PL intensity (Fig. 1) caused by the formation of neutral oxygen vacancy luminescent defects at the NP/matrix interface region, persisting even at annealing temperatures as high as 1373 K.

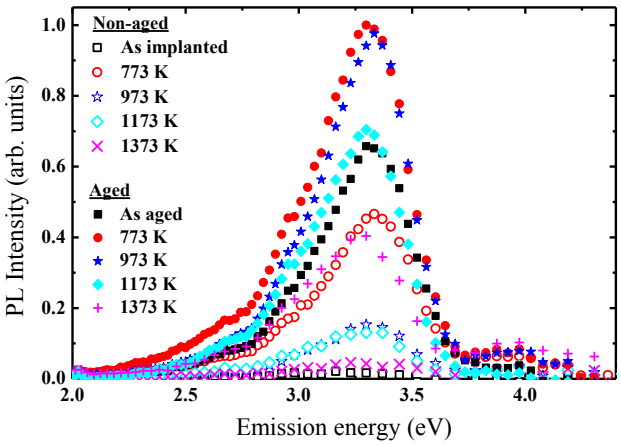

Figure 1. PL spectra of Sn-implanted SiO_2 layers after direct annealing in vacuum and after aging followed by annealing in vacuum for 0.5 h at different temperatures. Extracted from ref. [1].

[1] F. Kremer, F. P. Luce, Z. E. Fabrim, D. F. Sanchez, F. C. Zawislak, P. F. P. Fichtner. J. Phys. D: Appl. Phys. 45 095304 (2012).
[2] F. Kremer, J. M. J. Lopes, F. C. Zawislak and P. F. P. Fichtner, Appl. Phys. Lett. 91, 083102 (2007).