

EVIDENCE OF VARIABILITY OF THE LUMINESCENCE OF RHODAMINE 6G INFILTRATED IN OXIDIZED POROUS SILICON BY DIFFERENT HUMIDITY CONDITIONS

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The photoluminescence (PL) band of the dye rhodamine 6G (Rh-6G) infiltrated in porous silicon (PSi) has variations in its intensity and position due to its state (solid or liquid). It is important to quantify these variations if one wants to use PSi as the base of a sensor of the dye, to use it in a standard and reliable form. To check this variation we have studied the influence of the drying time (annealing time) and humidity of Rh-6G in thermally oxidized PSi. The samples are submitted to thermal treatment at different times, varying its solidification. In a second step, vaporizations were done in order to humidify the PSi surface and solvate the solid Rh-6G, to determine if the samples return to their original state.

The samples were prepared parting from single side polished p-type (100) Si wafers with resistivity of 0.01-0.02 Ωcm . The PSi was prepared by electrochemical etching applying a current density of 20 mA/cm^2 for 20 min. All samples were thermally oxidized at 300 °C and infiltrated with a solution of Rh-6G. Afterwards the samples were submitted to thermal treatment at 60 °C at different times. After measuring PL, they were vaporized at different times and the PL was recorded again.

The PL band of the heat treated samples showed a decrease in intensity with increasing annealing time, while it showed a shift of its position of 14 nm to smaller wavelengths comparing the wet samples and complete dry samples. The PL bands of the vaporized samples show an increase in intensity with increasing vaporization time, presenting a blue-shift of ~14 nm when the samples were wet again. The PL band of the wet samples is centered at 558 nm and shifts to smaller wavelengths when it is dried, and recovers its position when is wetted. This could be attributed to the solvation level of the dye.

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