

OXIDIZED POROUS SILICON AS A NONINTERFERENCE SUPPORT FOR LUMINESCENT DYES

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The objective of this work is to elucidate how useful is to passivate the surface states of porous Si (PSi) by thermal oxidation to be used as a host matrix. It is known that a large contribution to the Photoluminescence (PL) of PSi comes from defects at its surface [1]. This PL could overlap with the PL of the guest materials, making difficult to identify the details of the PL spectrum of the guest. Three sets of equal PSi single layers were prepared by electrochemical etching using (100) p-type Si wafers with resistivity of 0.01- 0.02 $\Omega\cdot\text{cm}$. The etchant contained a volume proportion of 60:30:10 of Ethanol (99.9%): HF (48%): Glycerol (99%). Set 1 is formed by as grown PSi layers. The PSi layers of sets 2 and 3 were thermally oxidized at 300 °C for 60 min under 10 ml/min oxygen gas flux. The oxidized PSi layers of set 3 underwent a silanization process by immersion in MPTS solutions and an infiltration by immersion into a 1.2 mM fluorescein solution and let drying at room temperature. From Fig. 1 it is clear the intensity of PL spectra of the PSi layer decreased substantially when oxidized, as expected. The SiO₂ quenches drastically the PL emission of PSi therefore serving well as a host matrix to infiltrate fluorescein dye with the addition of the MPTS linker. As can be inferred from Fig. 1, the PL spectrum of the sample infiltrated with fluorescein, may mainly originate from fluorescein.

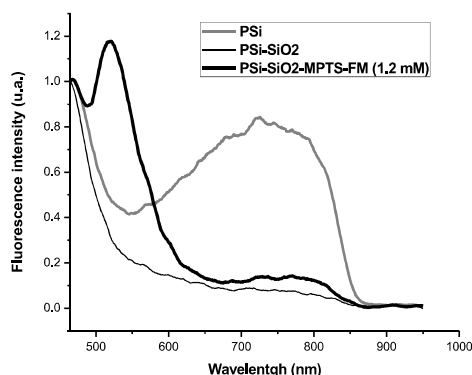


Fig.1: PL spectra of an as grown PSi layer, of a PSi layer thermally oxidized and of a PSi layer oxidized, silanized with MPTS and infiltrated with 1.2 mM of fluorescein.

References

[1] M. Otsuka, T. Matsuoka, L. S. Vlasenko. Appl. Phys Lett. **103** (2013) 111601.

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