Photoluminescence analysis influenced by passivation of oxidized structures of Porous Silicon

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Oxidation process is the most commonly used passivation method for porous silicon surfaces against morphology changes by guest molecules and temporal wear during the use or storage. Porous silicon is a material formed by etching silicon wafers, which has a structure and properties that depends on the substrate of silicon and its obtaining process by chemical or electrochemical etching. The photoluminescence is the most important propriety of the porous silicon. The propose of this study was to investigate and compare the photoluminescence of oxidized and non-oxidized structure of porous silicon chips and verify the influence of passivation around the silicon core. The porous silicon chips were obtained by electrochemical etching process of p-type monocrystalline wafers (100), 0.01-0.02Ωcm of resistivity. The oxidation was performed used a high temperature open tube furnace without flux during 1 and 5 hours. The qualitative analyses of the surface-chips were done by photoluminescence spectroscopy, Fourier transform infrared spectroscopy, scanning electron microscopy imaging, and X-ray diffraction. The thermal oxidation at 800 °C was found to be an effective oxidation method although it causes a decrease in the pore volume. The photoluminescence intensity was varied and dislocated to blue region of the spectrum (blue-shift) by reducing the pore volume.

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