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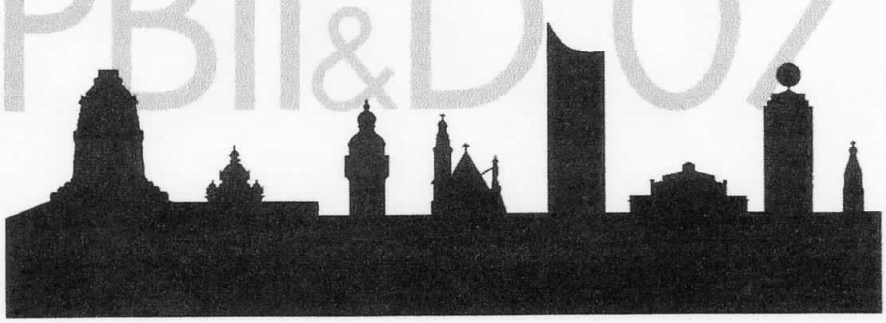

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FORMATION OF Si NANOCRYSTALS IN THE SiO_2/Si INTERFACE BY PLASMA IMMERSION ION IMPLANTATION

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Since the discovery of visible photoluminescence (PL) emitted by porous silicon and silicon nanoparticles, the interest of optical properties of Si nanocrystals by optoelectronic industry has been growing in the last years. Silicon nanostructures have been produced by several methods, including CVD, anodization with HF solution, co-sputtering, gas evaporation, but all these methods are not suitable for some applications. Another way to produce Si nanocrystals (Si-nc), with controlled depth distribution, is the Si ion beam implantation into SiO_2 and high temperature annealing, but this method also produce radiation damage on substrate surface. However, the formation of Si-nc into SiO_2 matrix by ion beams has been studied for years. By using recoil implantation technique, our present work aims to form Si-nc in the SiO_2/Si interface by Si recoil implantation, using high voltage plasma immersion ion implantation. A 20 nm SiO_2 film was deposited on (100) Si wafer by e-beam evaporation and, then, a 20nm Si film was deposited on the SiO_2 surface. After that, samples were bombarded with 75 keV nitrogen and argon ions for 60 and 120 minutes, and annealed in 1000°C for several minutes. As expected, the asymmetrical distortion to the left of the Rocking Curve peak obtained by high resolution XRD was larger for irradiation by argon ions than for nitrogen ions because of the size of the ion projectile and indicates significant ion implantation for both types of ions. Raman spectroscopy showed very low PL intensity for as-implanted samples. After annealing, PL intensity is expected to increase substantially. Surface morphology will be investigated by SEM analyses, as well as depth profile of implanted specimens by AES and cross-section analyses by TEM.