

Ultra shallow junctions을 위한 플라즈마 이온주입 공정 연구

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The study of plasma source ion implantation process for ultra shallow junctions

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Abstract: Further scaling the semiconductor devices down to low dozens of nanometer needs the extremely shallow depth in junction and the intentional counter-doping in the silicon gate. Conventional ion beam ion implantation has some disadvantages and limitations for the future applications. In order to solve them, therefore, plasma source ion implantation technique has been considered as a promising new method for the high throughputs at low energy and the fabrication of the ultra-shallow junctions.

In this paper, we study about the effects of DC bias and base pressure as a process parameter. The diluted mixture gas (5% PH₃/H₂) was used as a precursor source and chamber is used for vacuum pressure conditions. After ion doping into the Si wafer(100), the samples were annealed via rapid thermal annealing, of which annealed temperature ranges above the 950 °C. The junction depth, calculated at dose level of $1 \times 10^{18}/\text{cm}^2$, was measured by secondary ion mass spectroscopy(SIMS) and sheet resistance by contact and non-contact mode. Surface morphology of samples was analyzed by scanning electron microscopy. As a result, we could accomplish the process conditions better than in advance.

Key Words: Ion beam ion implantation, Plasma source ion implantation, Junction depth, Ultra shallow junctions.

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