

Comparison of Single-implanted and Co-implanted NP Junction in Laser Annealed Germanium

Universiti Teknologi Malaysia¹, Kyushu University², Xian Jiatong-Liverpool University³

^oSitiRahmah Binti Aid^{1,2}, NurNadhirah Mohamad Rashid¹, UmarAbdul Aziz¹, NurfarhanaArisa

Jonny¹, Hiroshi Ikenoue², Anthony Centeno³

E-mail: sitirahmah.aid@utm.my

Germanium (Ge) has re-emerged as one of the potential candidates to replace silicon (Si) as a substrate due to its higher carrier mobility properties that is one of the key points for the realization of devices high drive current. However, the fabrication process of np junction in Ge confronted with severe problem of low dopant electrical activation. This work reports the fabrication process of np junction in Ge substrate for single implanted (phosphorus-only) and co-implanted (phosphorus+ tin) samples followed by KrF excimer laser. Laser thermal annealing was performed with the laser pulse duration of 55 ns in an atmospheric ambient. Laser fluences of 300 and 500 mJ/cm², with 2-shot number were selected as annealing parameters. Results showed that higher activation with low sheet resistance (R_s) value ranging from 112 Ω/\square – 191 Ω/\square was obtained for all samples annealed at all laser parameters, with slight improvement of approximately 12% in the co-implanted sample was also observed, which could be due to the increase in stress/strain value. The range of junction depth obtained in this study was between 59 nm – 105 nm, with the shallow value was from the co-implanted sample annealed at lower laser energy of 300 mJ/cm² with 2- shot number.

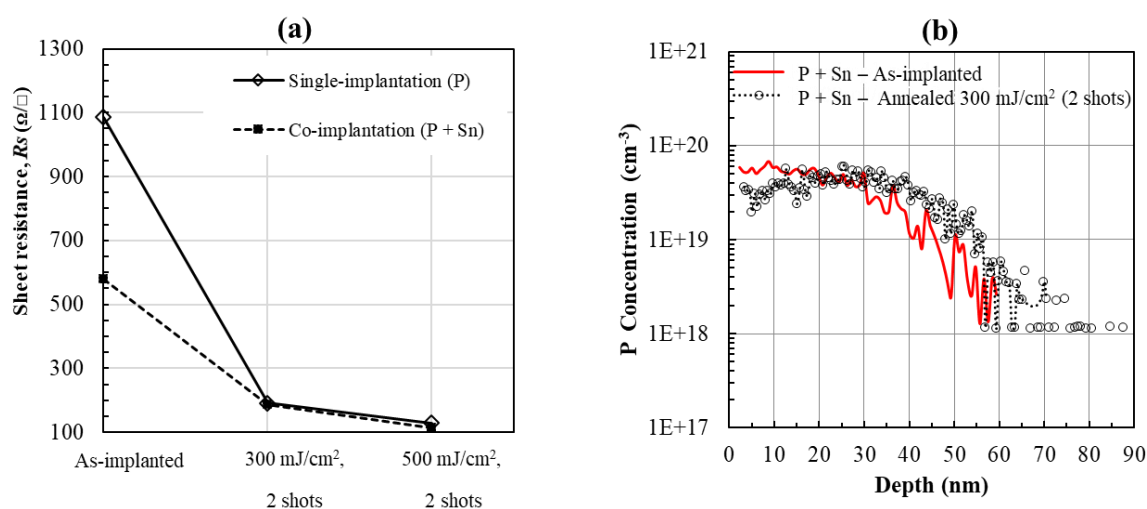


Fig. 1 (a) Average sheet resistance, R_s in single and co-implanted samples (b) SIMS Profile of P concentration

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