

PN Junction Formation by Two Step Annealings in N-Doped CZ-Si Crystals

C.S.Chen^a, C.F.Li^a, L.B.Li^b and D.L.Que^b

^aDepartment of Physics, Wuhan University, Wuhan

^bSemiconductor Materials Institute,
Zhejiang University, Hangzhou
P.R.China

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Using the generation and elimination of donors caused by electrically active defects in the N-doped CZ-Si crystals after different heat treatments, PN junctions can be fabricated by two step annealings in the p type wafers: The first step is to anneal the wafers at 400°C for a long time ($t > 60$ hrs.), it generates concentration about $2 \times 10^{16} \text{ cm}^{-3}$ of N-O donors in the wafers and changes their conductive type to the n type (revealed wafers). The second step is to anneal subsequently the surface of the revealed wafers by laser, it eliminates the N-O donors in the laser annealed region with a depth about the wavelength of the laser and returns the conductive type of this region to the original p type. So, a PN junction between annealed and unannealed region is fabricated. Electrical measurements show that the N-O donors in the laser annealed region are changed by adjusting the pulse energy of laser and good diode characteristics can be obtained by a suitable annealing condition. This method provides a simple, controllable, no donor dopants doping and low temperature fabrication of PN junction.

