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Reverse annealing of boron doped polycrystalline silicon

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Non-mass analyzed ion shower doping (ISD) technique with a bucket-type ion source or mass-analyzed ion implantation with a ribbon beam-type has been used for source/drain doping, for LDD (lightly-doped-drain) formation, and for channel doping in fabrication of low-temperature poly-Si thin-film transistors (LTPS-TFT's). We reported an abnormal activation behavior in boron doped poly-Si where reverse annealing, the loss of electrically active boron concentration, was found in the temperature ranges between 400℃ and 650℃ using isochronal furnace annealing. We also reported reverse annealing behavior of sequential lateral solidification (SLS) poly-Si using isothermal rapid thermal annealing (RTA). We report here the importance of implantation conditions on the dopant activation.

Through-doping conditions with higher energies and doses were intentionally chosen to understand reverse annealing behavior. We observed that the implantation condition plays a critical role on dopant activation. We found a certain implantation condition with which the sheet resistance is not changed at all upon activation annealing.