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Electronic stimulation of interstitial defect reactions in irradiated p-type silicon

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In silicon, the recombination enhancement of migration has been investigated in detail for aluminum interstitial (Ali) [1] and boron interstitial (Bi) [2]. Much less data are available on carbon interstitial (Ci) [3].
We found that electronic excitation by charge injection influences not only the behavior of single interstitial impurity atoms but also the formation and stability of their complexes with interstitial oxygen. Using forward current injection at room temperature with densities in the range of 15-30 A/cm2 the radiation induced boron-oxygen complex, which is the main compensating center in irradiated Si solar cells, can effectively be eliminated. Additionally, evidence has been obtained on the negative-U properties of the boron-oxygen complex. Forward current injection does not influence on the stability of the carbon-oxygen complex but enhances the transformation from its metastable to its stable atomic configuration during the association of mobile Ci with Oi.
Characteristics of these processes have been determined and their effects on radiation damage of silicon diodes are discussed.

1. J. R. Troxell et al., Phys. Rev. B, 19, 5336 (1979).

2. J. R. Troxell, G. D. Watkins Phys. Rev. B. 22, 921 (1980).

3. A. R. Frederickson, et al., J. Appl. Phys., 65, 3272 (1989).

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