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MODELING OF DLTS RESPONSE FOR SILICON DIODES WITH SPHERICAL AND ELLIPSOIDAL DEFECT CLUSTERS

The concept of defect cluster is widely used to interpret effects of neutron irradiation on electrical characteristics of semiconductor crystals and devices. To predict these effects one needs to know the types of defects inside the clusters (donors or acceptors), their spatial distribution and energy levels and also the cluster size and shape. In early papers by Gossick (1959) the electrical characteristics of neutron irradiated silicon were mainly analyzed using different variants of clusters with spherical symmetry. However, it seems that silicon clusters should have a more prolate form. This work presents results of numerical simulations of prolate cluster effects on the DLTS signal of divacancies in silicon.

Numerical modeling was performed using the finite element method. The results of the simulation were compared with experimental data obtained by DLTS method in order to identify unknown parameters of the cluster, particularly, the number of divacancies in the cluster.

From comparison with available experimental data, it has been shown that prolate cluster model gives more reasonable values of divacanciy number in a single cluster than it does the model of spherical cluster.

However, an ambiguity in interpretation of DLTS data remains. A model has been shown demonstrating that also paired divacancies give good results to explain the available DLTS data for neutron irradiated silicon.

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