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Investigation of the annealing behaviour of the donor-vacancy complex in alpha-particle irradiated Ge.

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Abstract content
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The annealing behaviour of the E-centre in Ge has been investigated by deep level transient spectroscopy (DLTS). The E-centre has been identified as the donor-vacancy complex. In this study Sb-doped Ge was used and the Sb-vacancy had an activation energy of 0.37 eV for electron emission as determined by DLTS. The defect has been introduced in this study by irradiating the Ge sample with alpha particles from an Am-241 source. The E-centre in Ge has been observed to anneal out in a two stage process. In the first stage the defect concentration decreases rapidly when the sample is heated to approximately 320 K, and then remains relatively constant with annealing temperature. In the final stage, at a temperature of approximately 370 K, the defect concentration decreases quite rapidly until the defect finally anneals out completely. A possible hypothesis is that the E-centre observed is in fact two different defects corresponding to the fast and slow annealing components. However, in this study, we find that both the slow and the fast annealing components of the E-centre have the same DLTS signatures (activation energy and apparent capture cross section) as well as the same true capture cross section. In effect, both the fast and the slowly annealing components of the E-centre seem to be the same defect. In this study, an investigation of this phenomenon is performed by investigating different irradiation and annealing procedures. We show that the fast annealing component of the E-centre can be explained by Ge self-interstitials, released from other radiation induced defects at 50 K recombining with the vacancy in the E-centre.

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