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High resolution transmission electron microscopy (HRTEM) investigations of silicon irradiated with high energy electrons

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The formation and evolution of extended defects following irradiation with 15 and 27 MeV electrons and further thermal annealing treatments have been observed by HRTEM on a high resolution analytical JEOL ARM 200F electron microscope. Clusters of point defects (vacancies and interstitials) with dimensions smaller than 3 nm are observed subsequent to irradiation. Their density increases with the energy of irradiated electrons. By thermal annealing at low temperatures (80oC), they start to agglomerate into extended planar defects lying in the {111} planes in the case of vacancies aggregations, or the {113} planes for the aggregation of interstitials. Their dimensions are in the range of 5-7 nm. Further annealing at 200 oC results in an increase in the density of the {113} interstitial-type defects, but not in their average dimension. Annealing at 270 oC produces an apparent decrease of the extended defects concentration.

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