Transient Point Defect Behavior in Czochralski-Grown Silicon Single Crystals

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The Czochralski crystal growth technique is the most widely used method for producing large silicon single crystals as substrates in the fabrication of electronic devices. The silicon wafers typically used in device fabrication are populated by distributions of microscopic precipitates, stacking faults and dislocation loops that result from the interactions of point defects - interstitials and vacancies - and impurities in the crystal during crystal growth, subsequent annealing of the crystal and device processing. The control of microscopic defects formed during crystal growth or subsequent anneal is one of the most important problems in the production of silicon wafer.
In this work, the continuum model of transient point defect dynamics to predict the concentration of interstitial and vacancy is established by estimating expressions for the thermophysical properties of point defects and the point defect distribution in a silicon crystal and the position of oxidation-induced stacking fault ring (R-OiSF) created during the cooling of crystals in Czochralski silicon growth process are calculated by using the finite element analysis.