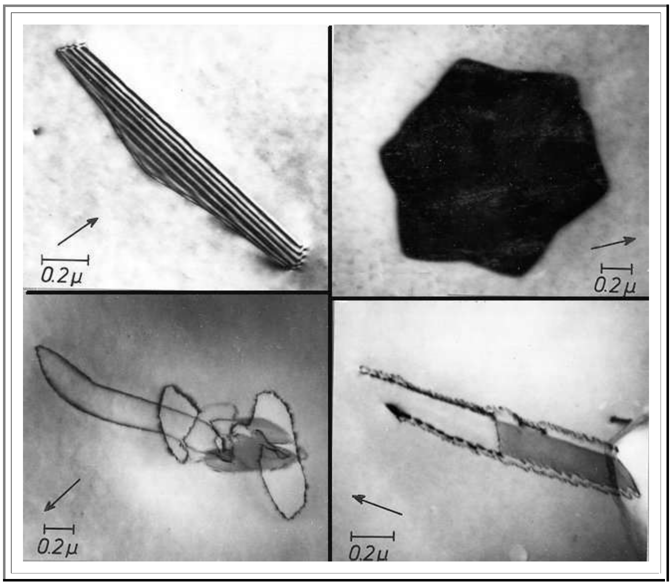
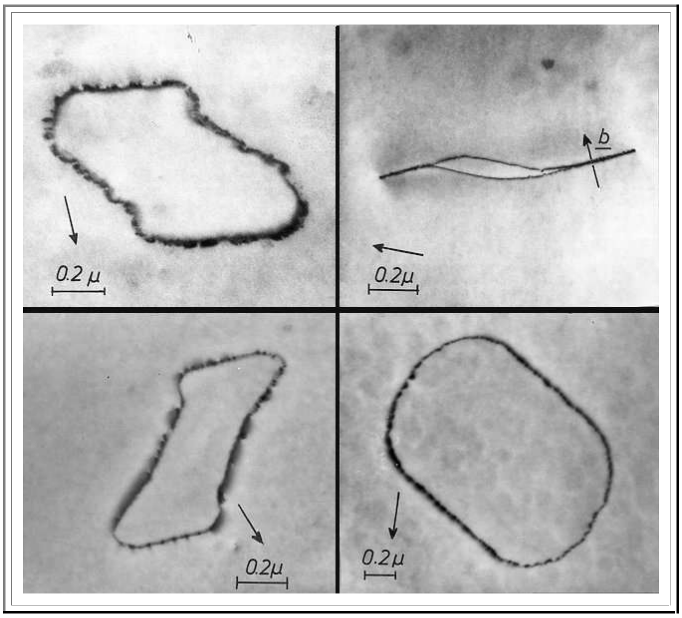
Generation of Dislocation Structures by Agglomeration of Interstitials in As-Grown Silicon Crystals

Illustration

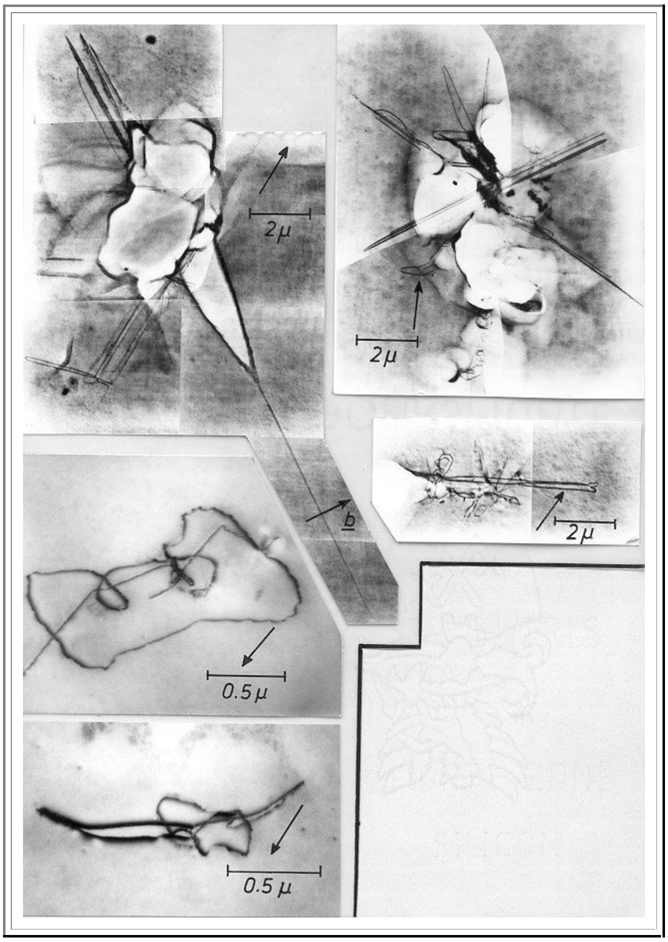
- The two top pictures, taken with a transmission electron microscope (**TEM**), show simple dislocation loops, bounded by Frank partials, which were generated by the agglomeration of interstitials. The stacking fault appears with characteristic stripes or at a brightness different from the background.
    - The loops are much larger than their equilibrium size - obviously the nucleation of the Shockley partial was not possible; maybe because the Frank dislocation line is decorated by impurity atoms.



    - The two pictures above show loop complexes. Some loops still contain stacking faults in parts oft their structures, but others are perfect and have started to move around.
- The pictures below show simple loops after the defaulting process. They are now bound by a perfect dislocation which assumed (more or less) hexagonal shape.
    - Two segments have started to move way. The "fuzzy" contrast of some dislocations may be due to impurity segregation or to tiny new Frank loops which nucleated at the dislocation core. This may happen because even after the primary loop has formed, there are still supersaturated interstitials which tend to agglomerate; but they now find efficient nucleation sites at the existing dislocations.



- Below are the end products. Complicated dislocation structures have formed; long dipoles were drawn out at some places. Add a little mechanical stress and you will have a crystal full of dislocations (and unsuited for integrated circuits).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