

## Dynamic Behavior of Many-Dislocation Systems in Silicon

**Kazuwo Imai**, Shigeru Fujinuma, Michio Kurashige

*Iwate University, Iwate, Japan*

The most remarkable feature of a silicon crystal deformed at a constant strain rate is the appearance of a Steady State of Deformation (SSD). The SSD appears shortly after the lower yield point and continues throughout stage I of the stress-strain curve. In this state the value of effective stress (the mean of the stresses acting on all the moving dislocations) remains constant irrespective of increase in dislocation density. The steady value depends on strain rate and temperature, but not on deformation history of the crystal. The present study simulates dynamic behavior of dislocations in silicon crystals deformed at constant strain rates, using a two-dimensional discrete-dislocation model. The model consists of infinitely repeated cells, each of which contains the same number of positive and negative mobile dislocations. Calculated results indicate that the experimentally observed SSD corresponds to the dislocated state that maximizes the mean internal stress on moving dislocations.

[View the extended summary](#)