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## **Discrete dislocation plasticity simulations of rate effects with solute and vacancy diffusion**

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### **ABSTRACT**

A two-dimensional discrete dislocation algorithm combined glide and climb is introduced to capture the rate-sensitivity under homologous temperature. Because of the different time scale of diffusive climb and dislocation slip, dislocation glide is assumed quasi-static motion; i.e., the equilibrium position is instantaneously achieved by the minimizing the total strain energy of the configuration. The short range effects are regarded as discrete events that altering the energy of the body. The climb is incorporated after all the long range and short range effects are accommodated. The climb rate is obtained by solving a diffusion boundary value problem. Because time scale of tracing the dislocation path is eliminated, the choice of loading rate and diffusion parameter can be practical number of interest. Numerical examples show that this quasi-static method is equivalent to discrete dislocation dynamics in absence of climb. Furthermore, positive rate sensitivity is observed over six order of strain rate while maintaining the same of level of computation.