Crystal Icr Software Crack REPACK Sites

in summary, our results are the first to quantify the effect of dislocation emission resistance on near threshold fatigue crack growth behavior. while previous atomistic studies have made use of a constant force to suppress dislocation emission, the current implementation provides a more realistic and accurate representation. our findings are in agreement with previous studies, which have demonstrated that only one slip plane is needed to allow dislocation emission to play a dominant role in crack growth. in contrast, previous work has indicated that the emission of multiple dislocations is critical for crack growth in various alloys, which is not in agreement with the findings of the current work. the current findings are also in agreement with previous work 34 , which has indicated that the emission of edge and screw dislocations can arrest crack growth in fcc aluminum. following the experimental observation of crack arrest, atomistic simulations of the transition to sustained crack growth were conducted. the idealized model of the 1d edge dislocation with a softening core was augmented with a poisson’s ratio of 0.33 and a symmetry boundary condition of perfect dislocation glide on the hard surfaces, to prevent dislocations entering or leaving the domain during loading. these modifications allowed for simulations of the initial transient growth while maintaining sufficient domain size to resolve the crack tip and the surrounding dislocation density field at all loading amplitudes and cycle counts. the initial transient response was extracted from the loading phase following the initial crack growth arrest, and fit with a paris law, yielding an exponent of 2.8 (fig. 1 f). in other words, the dislocation-mediated crack propagation behavior of these simulations is independent of loading amplitude and also in accordance with the limited 2d crystal model presented in section 2.3. by including a symmetry boundary condition, dislocations are prevented from entering or leaving the domain. this may explain the reason that the initial transient growth in fig. 1 b is not independent of loading amplitude.

to further examine the nature of the fatigue crack growth arrest and find additional mechanisms contributing to the phenomenon, a series of modified simulations of the transition to sustained crack growth were performed (fig. 1 h). as shown in the figure, increasing dislocation density, slip system orientation, and the crack tip strength have no effect on the observed phenomenon. although it is possible that the simulations are under sampled or that higher dislocation densities can be modeled, the observation that crack growth arrest is independent of these characteristics in vacuum is consistent with the hypothesis that dislocation emission and absorption are not sufficient for sustained near threshold fatigue crack growth in vacuum. moreover, a paris law fit on the initial transient growth region (fig. 1 i) shows that dislocation emission is not sufficient for crack growth, in accordance with the atomistic simulations presented in section 2.3. to gain further insight into the crack growth arrest phenomenon, we examine the dislocation density field surrounding the crack tip at late cycle counts (fig. 2), revealing that the dislocation density field evolves over time. the dislocation density distribution at the crack tip during the initial transient growth stage is characterized by a dislocation “bubble” surrounding the crack tip, suggesting that the crack tip serves as a source of dislocations. at the critical load (load at which sustained crack growth begins to occur), the dislocation bubble at the crack tip diminishes, and an annular dislocation density field appears near the crack tip (fig. 2 a), which subsequently evolves over time, forming a dislocation “cage” surrounding the crack tip (fig. 2 b). 5ec8ef588b

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