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Collective Prismatic Dislocation Loops Mechanism

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Unstable displacement burst observed in the indent load and depth curve of nanoindentation is much possible to be related to the collective dislocation behavior. We have recently reported that the first critical indent load at the first burst is almost linear to the first burst width. To resolve the reason of this experimentally obtained linearity, we must understand the collective prismatic dislocation loops mechanism. In the present research, the dislocation emission and the subsequent prismatic dislocation loop formation of a single crystalline aluminum under nanoindentation are simulated by the molecular dynamics. Also, the collective prismatic loops emitted at the misfitting particle model are calculated, qualitatively and quantitatively comparing with the micromechanics considerations by Ashby and Johnson.

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