Size-Dependent Failure Mechanisms in Metallic Nanostructured Nanowires

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Abstract:

In this study, we use the Large-scale Atomic/Molecular Massively Parallel Simulator to investigate size-dependent failure mechanisms in metallic nanowires with various nanostructures, including dislocations, twins, grain boundaries and stack faults. Embedded-atom method potentials are used to describe the atomic interactions. The results show that the failure mode of the nanostructured nanowires exhibit substantial size effects. For example, it is shown that these nanowires exhibit different modes of brittle-to-ductile translation as their length and nanostructure dimension (e.g. twin spacing) are changed.

Keywords: Molecular dynamics simulations; Mechanical properties; Nanowires; Twins; Dislocation.