Mechanical Properties and Behaviors of Hierarchically Nanotwinned Materials

under Indentation and Scratch

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Due to their excellent mechanical properties and great potential applications, nanotwinned materials have attracted much attention in the past decade. It has been found that the enhanced mechanical properties are close related to the nanoscale twins and it is thus expected that introducing more nanoscale twins into materials can further tailor their properties. In the present work, molecular dynamics simulations have been conducted to reveal the plastic deformation mechanisms in hierarchically nanotwinned copper that composed of primary and secondary twins under indentation and scratch. Moreover, the effects of the primary and secondary twin spacing on the mechanical properties have been investigated. Simulation results show that the presence of the primary and secondary twin boundaries induces a template effect on the dislocation activities. Supports from the NSFC (11272003, 11232003 and 11302037), the 973 Program (2010CB832704) and the NCET of Ministry of Education (NCET-13-0088) are gratefully acknowledged.

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