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Orientation Effects on Properties of Wear Tested Single Crystal Nickel

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Strength, friction, and wear control the performance and reliability of nickel based microdevices under sliding contacts. However, the effects of frictional contacts and wear are undefined. To address these effects, we have begun a program using nanoscratch and nanoindentation to study wear on <001> and <111> oriented single crystal nickel. Nanoscratch techniques were used to generate wear patterns as a function of load and cycles. Nanoindentation was used to measure properties in each wear pattern. The results for <001> single crystal nickel showed there was a strong increase in hardness with increasing applied wear load that was accompanied by a change in surface deformation. The <111> single crystal nickel exhibited similar behavior, but at a higher work hardening rate. In this presentation, we will show how crystal orientation affects deformation processes and properties under sliding contacts. This work was supported by Sandia National Laboratories under USDOE contract DE-AC04-94AL85000.

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