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On the Lifetimes of Nonaxisymmetirc Metallic Nanowires LAN GONG, New York University, JEROME BUERKI, California State University Sacramento, CHARLES STAFFORD, University of Arizona, DANIEL STEIN, New York University — We present a theoretical approach for understanding the stability of simple metallic nanowires, in particular monovalent metals such as the alkalis and noble metals. Their cross sections are of order one nanometer so that small perturbations from external (usually thermal) noise can cause large geometrical deformations. The nanowire lifetime is defined as the time required for making a transition into a state with different cross-sectional geometry. This can be a simple overall change in radius, or a quadrupolar deformation, or both. We develop a stochastic field theoretical model to describe this noise-induced transition process, in which the initial and final states correspond to locally stable states on a potential surface derived numerically from a nearly free electron model. The numerical "string method" is implemented to determine the optimal transition path governing the lifetime. Using these results, we tabulate the lifetimes of sodium and gold nanowires of several different initial geometries.

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