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Fast Electronic Relaxation in Metal Clusters via Excitation of Coherent Shape Deformations: Slipping Through a Bottleneck[1] VITALY KRESIN, University of Southern California, YURI OVCHINNIKOV, Landau Institute for Theoretical Physics, VLADIMIR KRESIN, Lawrence Berkeley Laboratory — We introduce and describe a fast electronic relaxation channel which is particular to free metallic nanoclusters. This channel overcomes the possibility of a phonon bottleneck by invoking the essential role of cluster shape deformations. Such a deformation entails the appearance of coherent surface phonon excitations and enables internal conversion at the level crossing point, thus allowing large energy transfer from an excited electron to the ionic subsystem. As a result, one can show that (unlike usual multiphonon processes) the shape deformation channel is capable of producing short electronic relaxation times, much less than a picosecond. The calculations are in agreement with recent pump-probe photoelectron measurements of relaxation in Al_n^- clusters.

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