Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Nanometer sized electrodes fabricated by electromigration of Au and Pd nanowires ALEXANDRU VLAD, SÉBASTIEN FANIEL, BENOîT HACKENS, VINCENT BAYOT, SORIN MELINTE, DICE - Université Catholique de Louvain, Louvain la Neuve, Belgium — Electromigration-driven metallic nanowire failure is presented. Here, Au and Pd nanowires patterned by electron-beam lithography were electrically stressed up to their breaking point. Feedback control and simple voltage sweep techniques have been successfully used to form nanometer-sized gaps. We observe a material- and geometry-dependent behavior. The Au nanowires showed a Joule-induced reversible resistance increase with the applied voltage up to the breaking point. In contrast, Pd nanowires presented an anomalous resistance decrease close to their failure point. This was associated to the melting and agglomeration of metallic grains within the electrically stressed nanowires. The SEM images acquired at intermediate stages of electromigration agree with the electrical data findings. The influence of the nanowire geometry upon the morphology of fabricated nanoelectrodes is considered. Beside the morphological characterization of our break junctions, we also measured their current-voltage characteristics. We observed single electron tunneling effects, probably due to the presence of metallic clusters formed close to the nanoelectrodes during the electromigration. Our results are consistent with recent findings on Coulomb blockade phenomena in electromigrated gold break junctions.

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Date submitted: 29 Nov 2007 Electronic form version 1.4