Abstract Submitted
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Formation of Stable Metallic Nanocontacts by mechanical annealing[1] CARLOS SABATER, Dep. of Applied Physics University of Alicante, Spain, CARLOS UNTIEDT, Dep. App. Phys. Univ. Alicante, SP, JUAN JOSE PALACIOS, Dep. of Condensed Matter Physics, Univ. Autonoma de Madrid, MARIA JOSE CATURLA, Dep. App. Phys. Univ. Alicante, SP — Metallic nanocontacts (NC) can be fabricated using STM or related techniques. In these experiments the size of the NC can be followed, down to the atomic contact, by measuring its electrical conductance. Such evolution will normally differ for each experimental realization and therefore conductance histograms are used to identify preferential configurations. It can be shown that occasionally there are some atomic configurations that can be repeated during consecutive cycles of mechanical deformation of the contacts. Here we report experiments for gold NC where the same trace of conductance can be obtained for hundreds of cycles of formation and rupture. We have studied the process leading to such repetitiveness of the traces and found that this is obtained when limiting the indentation depth between the two surfaces to a conductance value of approximately 5-6 G_0. Using molecular dynamics simulations we have obtained the same behaviour and observed how, after repeated indentations, the two metallic contacts are shaped into a stable configuration by mechanical annealing. This confirms and explains the fact that repeated indentation of a tip into a metallic substrate can be used as a method to sharpen or clean STM tips, but only when such indentation does not exceed a limit.

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