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Reduction of Barrier Height at Close Proximity between two Gold (111) surfaces.[1] YOSHIFUMI OSHIMA, YOSHIHIKO KURUI, Tokyo Institute of Technology — Work function is one of important physical properties in order to understand electron emission or chemical reactions such as catalysis. Work function changes locally depending on a defect, step or adsorbate on the surface. A scanning tunneling microscope (STM) is one of powerful tools to investigate such a local work function, which is called a local barrier height. In this method, the barrier height is defined as $\phi = (1/1.025 * d \ln G/dz)^2$, where G is conductance and z, the tip-surface distance. Experimentally, the barrier height has been reported to be constant independent of the distance. But, theoretically, it is suggested to be reduced at close proximity. In this study, we investigated the distance between two gold (111) surfaces in TEM observation simultaneously with measuring conductance value in a process of approaching each other. The distance changes controllably by a piezo actuator when it is above 1 nm, but the distance becomes narrower that the expected value obtained by a piezo actuator when it is below 1 nm. Obviously, structural relaxation is occurred when the distance between two gold surfaces is below 1 nm. Taking the structural relaxation into an account, we confirm that the barrier height is reduced at close proximity of two gold (111) surfaces.

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