Abstract Submitted
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Structural stability of Ni quantum point contacts under electrical stresses[1] KENJI YOSHIDA, AKINORI UMENO, SHUICHI SAKATA, KAZUHIKO HIRAKAWA, The University of Tokyo — We have investigated the structural stability of quantum point contacts (QPCs) of ferromagnetic metals under electrical stresses, using a spectroscopic method called "electromigration (EM) spectroscopy[1]"; i. e., we have applied a feedback-controlled electrical break junction method to Ni QPC samples and obtained a histogram of the critical junction voltages, V_c, at which there occurred one-by-one atom removal due to EM. The obtained histogram shows that V_c is distributed over a range of from $0.2 \sim 0.4$ V, which are consistent with the surface diffusion potential, E_D, of Ni. It was found that, although the local current density through the Ni QPCs is higher than 10^{10} A/cm^2, the Ni QPC is stable, as long as the junction voltage is less than a certain threshold voltage determined by E_D of Ni. The present result indicates that the junction voltage, rather than the current density, plays a critical role in EM in metallic QPCs and that the EM spectroscopy is a powerful tool for determining the structural stability of electrically-biased atomic-scale systems. [1] A. Umeno and K. Hirakawa, Appl. Phys. Lett. 94, 162103 (2009)

[1]JST CREST and MEXT (NanoQuine)

Kenji Yoshida
The University of Tokyo

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