Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Step stiffness and surface diffusion on Au(111) studied by LEEM
MICHAL ONDREJCEK, WACLAW SWIECH, MAHESH RAJAPPAN, C. PETER FLYNN, University of Illinois at Urbana-Champaign — Using LEEM we have examined the equilibrium step structure of Au(111) surface. The study is part of ongoing project of using step fluctuation spectroscopy on different fcc(111) and bcc(011) surfaces. From capillary wave analyses we obtained fluctuation amplitudes and relaxation times for Fourier components of the step edge displacement as functions of wave number q and temperature. Similar to Pt(111) and Pd(111) [1] the relaxation rates at $\sim$0.65 T_m vary accurately with wavevector q as q^3, showing that relaxation is driven by surface diffusion on the terraces. Bulk vacancy diffusion becomes the dominant relaxation mechanism at high temperatures, with $\tau_q^{-1} \sim q^2$. The results yield values for the surface and bulk mass diffusion coefficient, D_s=1.7x10^{-3} exp(-0.87eV/k_BT) cm^2/s; D_b=0.06 exp(-1.95eV/k_BT) cm^2/s. The orientation-dependent but only weakly temperature dependent step stiffness $\tilde{\beta}(\theta)$ was measured through the temperature range 900-1300K. The quantitative results of D_s are compared to the other closed packed surfaces at homologous temperatures relative to T_m. Finally we discuss the behavior of double steps formed at higher temperatures, The stiffness is about 1.4 times that of a single step. This research is supported by DOE grants DEFG02-02ER46011 and DEFG02-91-ER45439. [1] M. Ondrejcek, W. Swiech and C.P. Flynn, Surf.Sci. 566-568, 160 (2004).

Michal Ondrejcek
University of Illinois at Urbana-Champaign

Date submitted: 22 Dec 2004 Electronic form version 1.4