Abstract Submitted
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Resistance Measurements of Thin Silicon Nanomembranes in Ultra-high Vacuum[1] WEINA PENG, SHELLEY SCOTT, FENG CHEN, JAMES ENDRES, DONALD SAVAGE, IRENA KNEZEVIC, MARK ERIKSSON, MAX LAGALLY, University of Wisconsin Madison — Transport properties of thin silicon nanomembranes are very sensitive to surface conditions [1, 2]. Here we report van der Pauw measurements of the sheet resistance of thin silicon nanomembranes in ultra-high vacuum (UHV) conditions (base pressure 1.2 $\times 10^{-10}$ torr). The sample is cleaned in situ and the Si (100)-(2×1) reconstruction is verified with low energy electron diffraction (LEED). The sheet resistance is then measured as a function of back gate voltage, enabling determination of the sign of the charge carriers and the influence of electric field. Simulations enable an understanding of the interaction among the silicon nanomembrane body, the empty surface π^* band, and the back bonded Si-SiO_2 interface. Because of the large density of empty states in the π^* band, a strong influence from the surface on the silicon nanomembrane conductance is observed.

[1] Zhang P. et al., *Nature* **439** 703 (2006)
[2] Scott S. et al., *ACS Nano* **3** 1683 (2009)

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