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Surface charge transport in Silicon (111) nanomembranes[1] WEIWEI HU, SHELLEY SCOTT, RB JACOBSON, DONALD SAVAGE, MAX LAGALLY, University of Wisconsin-Madison, THE LAGALLY GROUP TEAM — Using thin sheets (nanomembranes) of atomically flat crystalline semiconductors [1], we are able to investigate surface electronic properties, using back-gated van der Pauw measurement in UHV. The thinness of the sheet diminishes the bulk contribution, and the back gate tunes the conductivity until the surface dominates, enabling experimental determination of surface conductance [2]. We have previously shown that Si(001) surface states interact with the body of the membrane altering the conductivity of the system. Here, we extended our prior measurements to Si(111) in order to probe the electronic transport properties of the Si(111) 7×7 reconstruction. Sharp (7×7) LEED images attest to the cleanliness of the Si(111) surface. Preliminary results reveal a highly conductive Si(111) 7×7 surface with a sheet conductance R_{s} of order of $\mu\mathrm{S}/\square$, for 110nm thick membrane, and R_{s} is a very slowly varying function of the back gate voltage. This is in strong contrast to Si(001) nanomembranes which have a minimum conductance several orders of magnitude lower, and hints to the metallic nature of the Si(111) surface. 1. Zhang, P. P. *et al.*, Nature 439, 703-706 (2006); 2. W. Peng, *et al.*, Nature Commun. 4, 1339 (2013).

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