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Electron Transport of a 2-D Electron System Gated on a Hydrogen-Passivated Si (111) Surface via a Vacuum-Silicon Interface K. ENG, R. N. MCFARLAND, B. E. KANE, University of Maryland at College Park — Creating a 2-D electron system to couple with atoms on a surface or to nuclear spins buried in semiconductors are non-trivial due to the inherent presence of disorder at the semiconductor-dielectric interface. However, it has been shown that the H-passivated Si surface in vacuum is an ideal candidate to build such devices because it can be atomically flat and entirely free of dangling bonds. We will discuss the characterization of a new field effect transistor which creates a 2D electron system on a H-passivated Si (111) surface gated through a vacuum-silicon interface. The H-Si (111) surface is preserved and encapsulated in a vacuum cavity via contact bonding of two silicon substrates (*). We report for the first time low temperature electron transport on H-Si (111) surfaces. Hall mobilities at 4.2K were measured to be $\sim$ 4000 cm^2/Vs which are higher than previous results in Si (111) MOSFETs. We also investigated the possible six-fold degeneracy of the H-Si (111) surface through low temperature (T$<$4K) magnetoconductance measurements up to B=12T. Results of the longevity of these new devices along with potential applications in quantum computing will also be discussed. * Discussed in talk given by R. N. McFarland, "Fabrication of Encapsulated H-Passivated Si (111) Surfaces for 2-D Electron Systems".

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