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A porous silicon diode as a source of low energy (< 0.1 eV) free electrons and its applications SUBRAHMANYAM PILLA, BRIAN NABERHUIS, JOHN GOODKIND, University of California, San Diego — We have developed a nanoporous silicon (PS) diode that yields free electron currents with energies < 0.1 eV below 77 K. The power dissipated during emission is low so that pulses of electrons can be produced below 100 mK without raising the temperature of the system. Free electrons were generated in liquid ^{4}He and ^{3}He as well. At 77 K, $>$ 40 nA/cm^2 of emission current density was obtained. The results suggest that a Poole-Frenkel type of mechanism accounts for the observed electric field enhanced conduction but the electron emission mechanism is not well understood in the present models of PS. Application of this low energy electron source in a quantum computing system using electrons on the surface of a dielectric film as well as lithography and electron microscopy will be presented.

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