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Exhibition of tunnel coupling of negatively charged dangling bonds on Si Surface Using Scanning Tunneling Microscope M. BASEER HAIDER, Dept of Physics, King Fahad University of Petroleum & Minerals, Saudi Arabia, L. LIVADARU, Dept of Physics, University of Alberta, Canada, J. PITTERS, National Institute for Nanotechnology, National Research Council of Canada, Canada, R. WOLKOW, Dept of Physics, University of Alberta, Canada — We have performed Scanning tunneling microscopy study of hydrogen terminated Si (100). We will show that single Si atoms in a solid state environment can be served as quantum dots. These negatively charged quantum dots can be tunnel coupled to the nearby Si quantum dots. We will demonstrate that this tunnel coupling can be controlled by adjusting the separation between the two Si atomic quantum dots. Moreover electron occupation in the tunnel coupled Si quantum dots can be controlled. We have used this tunnel coupling effect of Si atomic quantum dots to fabricate Quantum Cellular Automata Cells. Quantum Cellular Automata are used to transmit binary information through electrostatic interaction between adjacent cells without the transfer of charge from one cell to the next. Devices based on Quantum Cellular Automata will consume much less power compared to the conventional transistor based devices. Moreover, since there is no transfer of charge so power dissipation during its operation is minimal compared to conventional semiconductor devices. This Si based Quantum Cellular Automat Cell works at room temperature.

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