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Artificial Nanomagnet with Lateral Confinement LIFENG YIN, NOPPI WIDJAJA, JIAN SHEN, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA — For artificially low dimensional nanodots, the exchange interaction and dipole-dipole magnetostatic interaction can no longer stabilize the long range magnetic order at finite temperature. However, the electron-mediated indirect exchange interaction could be enhanced at surfaces due to the symmetry broken. A collective ferromagnetic behavior in two-dimensional Fe dot assemblies grown on a single crystal Cu(111) surface has been reported[1]. These Fe nanodots were grown using a novel method called buffer-layer assisted growth. The ferromagnetic ordering temperature appears to depend not only sensitively on the average spacing between the dots, but also strongly associated with the presence of surfaces states. The vicinal surfaces have been found a rich variety of novel behavior that results from broken translational symmetry by surface atomic steps. The presence of a free-electron-like Shockley surface state on the corresponding flat Cu(111) surface will be interrupted on vicinal surface. More interestingly, a switch between two qualitatively different regimes at a miscut of 7^o takes place[2]. In this work, a curve-polished Cu(111) ($0\sim8^o$ miscut) substrate is used to tune the surface electronic states, and in turn influences the electron-mediated indirect exchange interaction of Fe nanodots. [1] J. P. Pierce et al., Phys. Rev. Lett. 92, 237201 (2004). [2] J.E. Ortega et al., Phys. Rev. Lett. 84, 6110 (2000).

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