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A Graphical Approach for the Hamiltonian of T-J Model

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The calculation on the Hamiltonian is the central-dogma for exploring the properties of the materials. This article reports a novel methodology to simulate the evolution of the Hamiltonian in a graphical way. The T-J Model for superconductivities is taken as an example for the demonstration of this novel approach. Thought this graphical representation, renormalization and the related fluctuation of the ensemble can be visualized. It is interesting to note that the pictorial images for the exchange/double exchange mechanism in the TJ model can gives the information on the evolution of the system dynamics toward to the superconductivities. Appropriate post-analysis techniques can be implemented to explore some unique features during the phase change process of the Hamiltonian. Since the long range and the short range interactions will leads to different dynamics behaviorsof the Hamiltonian, it will reflect these phenomena on the frequency domain of the pictorial images. By using this graphical approach, a dimensionless number can be defined to indicate the criterions for the system dynamics.

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Electronic states of Ultrathin Co layers on Cu

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Ultrathin Co overlayers on top of Cu(100) and stepped (111) surface have been studied using (angle-resolved) photoemission spectroscopy. Recent interest in these system stem from two different phenomena at each surface. First at (100) surface, the alloying of Co and Cu has been reported using scanning tunneling microscope [1]. This effect could be very important in determining the overall characteristics of magnetic multilayered system. To understand this, the study of the electronic structure is essential. Second, the growth of Co on top of stepped Cu (111) has proved to form a quantum wire structure at low coverage limit [2].This system could be potentially important due to the strong anisotropy effect which can be a major role in spin-dependent scattering phenomena. Due to these growth characteristics, this system can be served to see the effect of the dimensional cross-over of the Co layer starting from quasi one dimension. The valence band spectrum of Co/Cu(100) clearly shows the change in its electronics structure. A peak at the binding energy of 0.3eV is representing the mixing of Co and Cu at the surface as has been observed by STM. This state becomes more enhanced upon annealing .This state is quite consistent with the recent LMTO band calculation in buried Co in between Cu layers[3]. Mixing of Co overlayer with Cu atoms on top of (111) Cu surface is relativelysmall at room temperature. One dimensional and followed by two and three dimensional Co wires has been carefully studied. Several results will be presented. First, the dimensional crossover of the Co 3d band has been studied. Second, temperature effect is involved to study the effect of the film morphology and the step contribution to the surface state. Third, we have studied the variation of the surface state of Cu upon variation of the converge of Co.

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