9.7 cm

STABILITY OF STRIPE PHASES IN THE HUBBARD MODEL

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Motivated by the experimental discovery of stripe phases in the cuprates [1], we investigate the stability and magnetic ordering in various stripe phases obtained for the two-dimensional Hubbard model with and without static phonons using finite 8×8 clusters with periodic bondary conditions solved within the Hartree-Fock (HF) approximation and in a variational *local ansatz*. The magnetic order is antiferromagnetic (AF) at half-filling ($n = 1$), and it changes to a nonhomogeneous charge and magnetization distributions at finite hole doping $\delta > 0$. Nonmagnetic vertical (01) stripes, found before as only locally stable in the HF approximation [2], are stabilized by local correlations and give the ground states for the underdoped ($\delta = 1/8$) and overdoped ($\delta = 1/4$) systems. At both doping levels the charge unit cell is by a factor of two smaller than the magnetic one and consists of four atoms, with domain walls separating AF domains and filled by one hole per two (one) wall atoms at $\delta = 1/8$ ($\delta = 1/4$). Finite next neighbor hopping elements, t' and t'', stabilize extended diagonal stripes, similar to those found in the dynamical mean-field theory [3]. These findings show that several types of stripe ordering compete with each other in the regime relevant for the cuprates in qualitative agreement with the experimental results [1].

[1] J. M. Tranquada *et al.*, Phys. Rev. B **54**, 7489 (1996).
[2] J. Zaanen and A. M. Oleś, Ann. Phys. (Leipzig) **5**, 224 (1996).
[3] A. I. Lichtenstein *et al.*, J. Supercond. **12**, in press (1999).

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