

Abstract Submitted  
for the MAR08 Meeting of  
The American Physical Society

**Pattern formation in mixtures of different mass ultracold atoms in optical lattices: an inhomogeneous DMFT study**<sup>1</sup> JAMES FREERICKS, Department of Physics, Georgetown University — Dynamical mean-field theory (DMFT) is generalized to include an inhomogeneous trap and applied to the problem of different mass spin-polarized fermionic atoms that have an interspecies interaction  $U$ . Such a system is described by the spinless Falicov-Kimball model in a harmonic trap (in the limit where the more massive atom is localized on the optical lattice); we examine atoms moving on a 51X51 two-dimensional square lattice. When the temperature is low enough, the system exhibits pattern formation with different types of order, ranging from checkerboard phases and phase separation to an analog of the viscous fingering seen in immiscible liquids. The temperature evolution of these ordered patterns are interesting as well, as the system can form rings of ordered phases surrounding disordered phases, which expand in size as  $T$  is lowered. These patterns can be detected with noise-correlation spectroscopy or Bragg scattering, and their evolution with  $T$  could be employed for thermometry. The inhomogeneous DMFT algorithm parallelizes well and is quite efficient. The main difference with exact numerical solutions or the local density approximation is that the temperature scales for the ordering are significantly higher in the IDMFT solution.

<sup>1</sup>Supported by DARPA under grant number W911NF-07-1-0576.

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Date submitted: 03 Dec 2007

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