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Designing mixtures of ultracold atoms to boost T_c[1] KHADIJEH NAJAFI, JAMES FREERICKS, Georgetown University, MACIEJ MASKA, University of Silesia, PAUL JULIENNE, Joint quantum Inistitute, KAHLIL DIXON, Howard University — Mixtures of light and heavy atoms, with the light atom a fermion (and the heavy atom having either statistics), have a density wave ordering pattern that is analogous to the antiferromagnetic phase transition in the Hubbard model. For a single species mixture, the T_c is about half the Hubbard model T_c for the same interaction strength. As the degeneracy of the heavy species increases, the T_c is boosted by entropic effects that scale approximately linearly in the number of species. Hence, increasing the species to 3 or 4 states for the heavy particle will be enough to raise T_c above temperatures already reached for the three-dimensional Hubbard model on an optical lattice. [2]. We discuss a number of different possible mixtures which might achieve this enhanced T_c and allow ultracold atoms on optical lattices to study ordered quantum phases in the low-temperature regime.

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[2]A. Hart, P. M. Duarte,T. L. Yang, X. Liu, T. Paiva, E. Khatami, R. T. Scalettar, N. Trivedi, D .A. Huse R. G. Hulet, Nature 519, 211214 (2015)

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