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Two-species fermion mixtures with mass and population imbalance MENDERES ISKIN, CARLOS SA DE MELO, Georgia Institute of Technology — We analyze the phase diagram of uniform superfluidity for two-species fermion mixtures from the Bardeen-Cooper-Schrieffer (BCS) to Bose-Einstein condensation (BEC) limit as a function of the scattering parameter and population imbalance. We find at zero temperature that the phase diagram of population imbalance versus scattering parameter is asymmetric for unequal masses, having a larger stability region for uniform superfluidity when the lighter fermions are in excess. In addition, we find topological quantum phase transitions associated with the disappearance or appearance of momentum space regions of zero quasiparticle energies. Lastly, near the critical temperature, we derive the Ginzburg- Landau equation, and show that it describes a dilute mixture of composite bosons and unpaired fermions in the BEC limit.

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