

Abstract Submitted  
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**Pairing and crystallization of one-dimensional atomic mixtures with mass imbalance** TOMMASO ROSCILDE, Ecole Normale Supérieure de Lyon - France, MARCELLO DALMONTE, CRISTIAN DEGLI ESPOSTI BOSCHI, Bologna University - Italy — We numerically investigate mass-imbalanced binary mixtures of hardcore bosons (or equivalently of fermions) loaded in one-dimensional optical lattices, with special focus on their instabilities towards the loss of first-order (one-body) coherence. We find a fundamental asymmetry between attractive and repulsive interactions. Attraction is found to always lead to pairing, and to pair crystallization for very strong mass imbalance and commensurate fillings. In the repulsive case away from half filling the two atomic components remain instead decoupled (and first-order coherent) over a large parameter range, and undergo crystallization or phase separation only for large mass-imbalance and/or strong interactions. This fundamental asymmetry is at odds with recent theoretical predictions, and can be tested directly via time-of-flight experiments on trapped cold atoms.

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