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Glassy behavior of Bose-Bose mixtures in one-dimensional optical lattices IGNACIO CIRAC, TOMMASO ROSCILDE, Max-Planck Institute for Quantum Optics — We numerically investigate the properties of strongly repulsive two-boson mixtures in one-dimensional optical lattices, targeting their ground state either by slow cooling from high temperature, or by a slow change in the Hamiltonian parameters starting from the weakly interacting regime. The two bosonic species have very different effective masses, so that the slow bosons can act as an effective potential to the faster ones. When the interspecies repulsion is strong compared with the intraspecies one, a phase-separated ground state is masked by an exponentially large number of metastable *quantum emulsion* states, in which the two species are fragmented into microscopic droplets. The quantum emulsion states can be regarded as the out-of-equilibrium realization of a localization phenomenon, in which each species acts as a random potential to the other one, effectively localizing it. Quantum Monte Carlo investigations reveal an extremely slow relaxation of the system towards equilibrium, typical of a glassy phase. Increasing the intraspecies repulsion for the fast bosons drives them through a quantum phase transition to the superfluid state.

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