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Mapping From Soft to Hard-Core Disks Near the Athermal Shear Driven Jamming Transition[1] PETER OLSSON, Department of Physics, Umeå University, 90187 Umeå, STEPHEN TEITEL, Department of Physics and Astronomy, University of Rochester, Rochester, NY 14627 — We examine the rheology of soft-core, bidisperse, frictionless disks in two dimensions at zero temperature with overdamped dynamics. For shear driven flow at a uniform strain rate $\dot{\gamma}$, we find a simple expression for an effective hard-core packing fraction, $\phi_{\rm eff}$, such that the pressure equivalent to the shear viscosity, $p/\dot{\gamma}$, for different shear rates, packing fractions, and different contact interactions all collapse onto a common curve when plotted as a function of $\phi_{\rm eff}$. This function is a characteristic of the hard-core limit as it describes the system in the limit of vanishing particle overlaps. This mapping recovers all the critical behavior found in earlier scaling analyses. We use this mapping to derive a duality relation that gives the exponent of the non-linear Herschel-Bulkley rheology *above* jamming in terms of the exponent of the diverging viscosity *below* jamming.

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