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Structural equivalence of equal-energy vapor deposited and liquid cooled films in two dimensions DANIEL REID, IVAN LYUBIMOV, JUAN DE PABLO, Univ of Chicago — Vapor deposition has been shown to provide a means of producing supercooled liquids with exceptional structural and kinetic stability compared to samples prepared by gradual cooling of a liquid. In this work, we study two-dimensional binary glassy films formed by vapor deposition and liquid cooling. We show that distinctive local structural regimes correspond directly to the structural energy of these films. We find the path towards equilibrium to be characterized by a transition in these structural regimes from medium sized square-ordered clusters to states with significant pentagonal local order. Tracking the degree of local order over a range of structural energies using both formation strategies, we find that the structure of vapor deposited and liquid cooled films are equivalent in films with equal inherent structural energies. Previous work has found that the substrate temperature that yields minimum energy for a vapor deposited film lies near 85% of the material's glass transition temperature. Our simulations indicate that in two dimensions, the optimal substrate temperature for stable glass formation decreases with deposition rate.

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