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Glasses and Liquids Low on the Energy Landscape Prepared by Physical Vapor Deposition SHAKEEL DALAL, University of Wisconsin - Madison, ZAHRA FAKHRAAI, University of Pennsylvania, MARK EDIGER, University of Wisconsin - Madison — The lower portions of the potential energy landscape for glass-forming materials such as polymers and small molecules were historically inaccessible by experiments. Physical vapor deposition is uniquely able to prepare materials in this portion of the energy landscape, with the properties of the deposited material primarily modulated by the substrate temperature. Here we report on high-throughput experiments which utilize a temperature gradient stage to enable rapid screening of vapor-deposited organic glasses. Using ellipsometry, we characterize a 100 K range of substrate temperatures in a single experiment, allowing us to rapidly determine the density, kinetic stability, fictive temperature and molecular orientation of these glasses. Their properties fall into three temperature regimes. At substrate temperatures as low as $0.97T_g$, we prepare materials which are equivalent to the supercooled liquid produced by cooling the melt. Below $0.9T_g$ ($1.16T_K$) the properties of materials are kinetically controlled and highly tunable. At intermediate substrate temperatures we are able to produce materials whose bulk properties match those expected for the equilibrium supercooled liquid, down to $1.16T_K$, but are structurally anisotropic.

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