How much time is needed to form a stable glass? AC calorimetric study of vapor-deposited glasses of ethylcyclohexane CHRISTOPH SCHICK, YEONG ZEN CHUA, MATHIAS AHRENBERG, University of Rostock, MICHAEL TYLINSKI, MARK D. EDIGER, University of Wisconsin-Madison — Consistent with previous work on other organic molecules, we observe that highly stable glasses are formed at substrate temperatures around 0.85 Tg, where Tg is the conventional glass transition temperature. Ethylcyclohexane is the least fragile organic glass-former for which stable glass formation has been established. The isothermal transformation of the vapor-deposited glasses into the supercooled liquid state was also measured. At eight substrate temperatures, the transformation time was measured for glasses prepared with deposition rates across a range of four orders of magnitude. At low substrate temperatures the transformation time is strongly dependent upon deposition rate, while the dependence weakens as Tg is approached from below. These data provide an estimate for the surface equilibration time required to maximize kinetic stability at each substrate temperature. This surface equilibration time is much smaller than the bulk alpha-relaxation time and within two orders of magnitude of the beta-relaxation time of the ordinary glass. Stable glasses are formed even for substrate temperatures below the Vogel and the Kauzmann temperatures. Surprisingly, glasses formed in the limit of slow deposition at the lowest substrate temperatures are not as stable as those formed near 0.85 Tg.

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