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Stable Nanostructured Polymer Films Formed Via Matrix Assisted Pulsed Laser Evaporation YUNLONG GUO, KIMBERLY SHEPARD, RODNEY PRIESTLEY, Princeton University — Via typical routes to the vitreous state, the ability to significantly alter the properties of amorphous solids is restricted due to the kinetic nature of the glass transition. In this talk, we show that matrix assisted pulsed laser evaporation (MAPLE) can be used to form ultra-stable and nanostructured glassy polymers with significantly reduced densities, enhanced glass transition temperatures, and superior kinetic stability at high temperatures. Relative to the standard poly(methyl methacrylate) glass formed on cooling at standard rates, glasses prepared by MAPLE can be 40 percent less dense and have 40 K higher glass transition temperatures. Furthermore, the kinetic stability in the glassy-state can be enhanced by 2-orders-of-magnitude. The unique combination of properties is a result of the glass morphology, i.e., the glassy films are formed by the assembly of nearly spherical-like polymer nanoglobules.

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