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Synthesis and Characterization of Exceptionally Stable Glasses of 1,3-Bis(1-naphthyl),5-(2-aryl)benzene[1] TIANYI LIU, KEVIN CHENG, ELMIRA SALAMI, FENG GAO, CHEN LI, Department of Chemistry, University of Pennsylvania, XIAO TONG, Brookhaven National Lab, YUE ZHANG, YI-CHIH LIN, WILLIAM ZHANG, ETHAN GLOR, PATRICK WALSH, ZAHRA FAKHRAAI, Department of Chemistry, University of Pennsylvania — Stable glasses can be prepared by physical vapor deposition (PVD). Compared to ordinary glasses, stable glasses have exceptional properties such as higher density and thermal stability. Deposition temperature is one of the most important parameters that controls the properties of PVD glasses. When scaled to the glass transition temperature (T_g), most stable glasses are usually obtained at deposition temperatures around 0.85 T_g. Chemical structure, entropy of super-cooled liquid, fragility and enhanced mobility may all affect the most stable structure obtained via PVD . To examine the effect of chemical structure, specifically the molecular weight effect on the stability of PVD glasses, we synthesized and characterized stable glasses of small organic molecule 1,3-bis(1-naphthyl),5-(2-naphthyl)benzene (α,α,βTNB) and its molecular analogues. With systematically changing its chemical structure, thermal expansion coefficients, fictive temperature and density of stable glasses all vary systematically. These results indicate the robust nature of stable glass formation and can elucidate the processes by which these glasses are formed.

[1]University of Pennsylvania, National Science Foundation

Tianyi Liu
University of Pennsylvania

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