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Birefringence and Enhanced Stability in Stable Organic Glasses[1]
TIANYI LIU, ANNEMARIE EXARHOS, KEVIN CHENG, TIEZHENG JIA, PATRICK WALSH, JAY KIKKAWA, ZAHRA FAKHRAAI, Univ of Pennsylvania
— Stable glasses can be prepared by physical vapor depositing organic molecules onto a cold substrate at slow rates. These glasses have many exceptional properties such as high thermal stability, high density, and birefringence. Regardless of the molecular shape or intermolecular interactions, birefringence has been observed in various stable glasses produced at low temperatures (below 80% of the molecule's glass transition temperature, T_g). Here we prepare stable glasses of an organic molecule, 9-(3,5-di(naphthalen-1-yl)phenyl)anthracene, that possesses a nearly isotropic shape and intrinsic fluorescence. Ellipsometry is used to show that all stable glasses prepared in the temperature range from 73% T_g to 97% T_g show positive birefringence. Angle- and polarization- dependent photoluminescence measurements show isotropic molecular orientation in these optically birefringent glasses. Furthermore, the values of birefringence are strongly correlated with the enhanced density, implying a general origin of the observed anisotropy in stable glasses. This correlation can elucidate the role of packing in the formation of such high-density glasses.

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Tianyi Liu
Univ of Pennsylvania

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