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Surprising increase in photostability of organic amorphous materials by efficient molecular packing YUE QIU, Univ of Wisconsin, Madison, LUCAS ANTONY, JUAN DE PABLO, University of Chicago, MARK EDIGER, Univ of Wisconsin, Madison — Photochemically robust materials are desired for organic electronics. Previous work has demonstrated that crystal packing can strongly influence photochemical reactivity. In amorphous materials, however, similar efforts to tune photostability have not been successful. In this work, we show that organic glasses prepared by physical vapor deposition can be highly stable against photo-isomerization. Disperse orange 37 (DO37), an azobenzene derivative, is studied as a model molecule. The thickness and molecular orientation of DO37 thin films can be altered by the photo-isomerization reaction. We use spectroscopic ellipsometry to measure sample thickness and molecular orientation during light irradiation. By changing the substrate temperature during the deposition, photostability can increase 2 to 3 orders of magnitude relative to the liquid-cooled glass. We find that photostability correlates with density of packing, with density increases of up to 1.3%. Simulations also show that glasses with higher density can be significantly more photo-stable. These results show for the first time that photostability of glasses can be significantly modulated by molecular packing. And they may provide insight in designing organic photovoltaics and light emission devices with longer lifetimes.

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