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Slowing down of accelerated physical aging in ultrathin polymer films[1] QIYUN TANG, WENBING HU, State Key Laboratory of Coordination Chemistry, School of Chemistry and Chemical Engineering, Nanjing University, 210093 Nanjing, China, SIMONE NAPOLITANO, Laboratory of Polymer and Soft Matter Dynamics, Universite Libre de Bruxelles, 1050, Belgium — The investigation of physical aging in glassy polymer films has attracted great attention recently due to its potential application in polymer-based nano-devices. For thin polymer films, many experiments confirmed the accelerated physical aging behaviors by lowering the film thickness towards nanoscale. Here we demonstrate with molecular simulation that the accelerated aging behaviors in thin polymer films could be slowed down at the extremely low film thickness, which can be attributed to an inversed vacancy diffusion process caused by the sliding motion of chain molecules. Our results provide the direct evidence of the relationship between the sliding motions of short chain-fragments and the physical aging of ultrathin polymer films, and also identify the existence of a new confinement effect at the nanoscale.

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