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Structural relaxation of vapour-deposited colloidal glass[1] XIN CAO, HUIJUN ZHANG, YILONG HAN, Hong Kong Univ of Sci Tech, YILONG GROUP COLLABORATION — Freshly made glasses by vapor deposition exhibit ultra-stability similar to fully aged glasses formed by quenching liquids. It has been suggested that the mobile surface layers in vapor deposition accelerates the aging process, but its mechanism is unclear. Here we study the vapor deposition process of colloidal glass by video microscopy and MD simulation with single-particle dynamics. We found that the structural relaxation near the surface, characterized by cooperative-rearrangement regions (CRRs), is much stronger during the deposition process than after deposition due to the perturbation of newly attached particles. Near the surface, a thermal-induced vacancy can triggered a large CRR which propagates from the vacancy to the surface. Deep inside the bulk, CRRs are rare, smaller and cannot propagate to the surface. By measuring the evolution of free-volume entropy , we found that the strong structural relaxation is accompanied by local free energy decreasing.

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