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Deformation in Thin Glassy Polymer Films from Surface towards Interior MITHUN CHOWDHURY[1], Princeton University, JOHANN P. DE SILVA, GRAHAM L.W. CROSS, Trinity College Dublin — Polymer thin glassy films occupy an important place in last two decades of condensed matter research, concerning its surprising surface mobility and spatially dependent structural relaxation. However, ranges of cleverly designed indirect measurements on confined polymer glassy films already probed its mechanical properties; it is still a challenging task to directly probe such small confined volume through conventional mechanical testing. We have designed confined layer compression testing with a precisely designed and aligned flat probe during nanoindentation, which was further accompanied with atomic force microscopy. Due to natural confinement from the surrounding material, we show that a state of 'uniaxial strain' is created beneath the probe under small axial strains. By this methodology we are able to directly probe uniaxial flows under both anelastic and plastic conditions while doing controlled creep studies at different positions in the film starting from surface towards interior. Depending on the extent of deformation, we found ranges of effects, such as densification, anelastic yield, and plastic yield. Enhanced creep rate upon deformation supports the idea of 'deformation induced mobility'.

[1]Work performed at Trinity College Dublin

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