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Annealing History Dependence of Young's Modulus in Thin Polymer Films Using an Axi-symmetric Peel Test Apparatus

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— We present a study of chain relaxation in thin spincast films above the glass transition temperature. We employ a novel axi-symmetric peel test, which uses the deformation of a thin spincast polymer film brought into contact with a flat substrate. The use of a thin membrane minimises uncertainty in the contact radius while the use of spincast films provides very smooth surfaces by means of a very simple method. The experimental profile of the deformed membrane shows good agreement with the expected logarithmic profile. While this agreement allows measurement of the Young's modulus and solid-solid work of adhesion in thin films, this study will focus on the dependence of the Young's modulus on the annealing history in thin films. The thermal history dependence shows that for short annealing times Young's modulus is larger than expected, suggesting that the chains are oriented during spincasting. For longer times, Young's modulus reaches literature values.

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