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# Instabilities and dewetting of thin polymer films close to the glass transition

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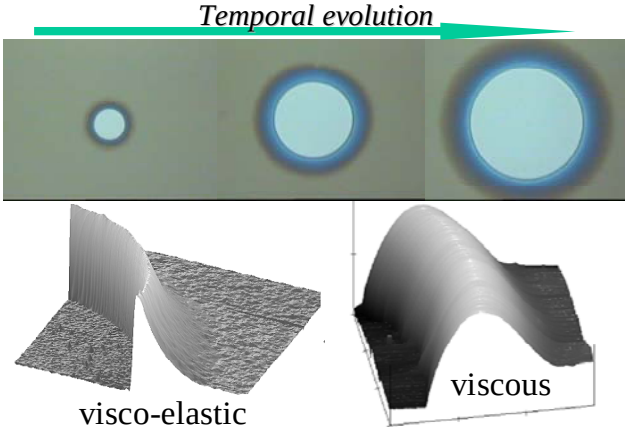
Dewetting experiments represent an attractive, i.e. simple and fast, possibility for linking molecular and interfacial properties with macroscopically observable parameters like the shape of the part collecting the removed material, i.e. the rim. In this talk, I will present systematic dewetting studies on highly viscoelastic polymer films retracting from a non-wettable polydimethylsiloxane (PDMS) coated substrate. The substrate properties were varied from comparatively solid to rather soft by increasing the thickness of the PDMS coating.

The influence of dewetting temperature, molecular weight of the polymer, age of the film and frozen-in non-equilibrated chain conformations on the process of dewetting was investigated. Dewetting passed through various regimes, which could be related to relaxation processes of parts of the molecules or the whole chains.

The interplay of equi-biaxial tension within the film and the strain induced in the soft elastic substrate was shown to lead to a two stage process characterized by a transition between an initial hole-growth process that subsequently slowed down drastically and a Rayleigh-type fingering instability of the dewetting rim leading to an acceleration of dewetting. The release of compressive strains in the substrate led to slippage of the film which contributed to rim instability and promoted the growth of the dendritic holes. Our results illustrate the important interplay of visco-elastic properties of ultrathin polymer films and the deformability of the substrate.




*Hole growth in the course of dewetting of polymer films close to the glass transition and two characteristic shapes of the rim representing early and late stages where visco-elastic and viscous properties dominate, respectively.*

**References:**

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