

Internship location: Soft Matter Sciences and Engineering Lab (SIMM) – ESPCI – UMR7615

Industrial partnership: Saint Gobain Research Paris => funding : yes

Possibility for a Doctoral thesis: CIFRE Saint-Gobain Recherche

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M2 Internship

Friction and elasticity of folded polymer films

Scientific description:

The production of laminated glass for windscreen involves a preliminary stage where a solid polymer film is unrolled on a translated flat glass substrate (Fig. 1a). During this stage, it is crucial that the film does not form wrinkles which could be trapped during the subsequent lamination stage (Fig. 1b) and result in detrimental optical defects.

The formation and trapping of wrinkles depends on the coupling between the strain energy stored in the folded part of the film and the frictional properties of the interface between the polymer film and the glass substrate.

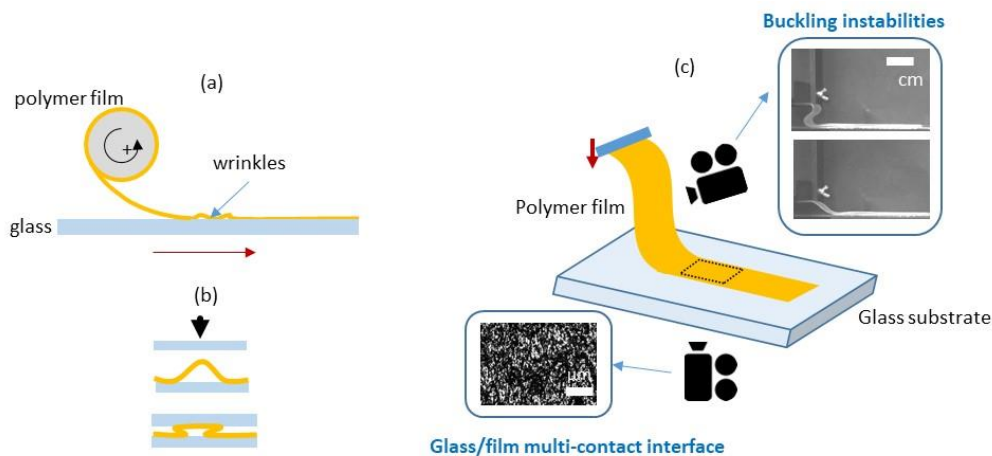


Figure 1 : Deposition of a polymer film on a glass substrate. (a) Schematic of the industrial process; (b) trapping of folds during lamination process; (c) Experimental set-up.

How does the interplay between film deformation and friction affect the development of buckling instabilities and fold trapping? What is the contribution of film roughness and polymer viscoelasticity? To answer to these questions, we will carry out experiments in which a viscoelastic polymer strip is laid at imposed vertical velocity on a glass plate (Fig. 1c) while the development of buckling instabilities and friction at the rough contact area at the glass/PVB interface are continuously monitored. Based on these observations, we will seek to develop a physical description of the role of friction in the formation and trapping of wrinkles in relation to the mechanical and roughness properties of the polymer film.

Speciality : Soft matter Physics

Techniques/methods in use: contact experiments using dedicated setups, image processing.

Applicant skills: taste for experimentation, knowledge in polymer physics/mechanics