Temperature transition above Tg in amorphous polymer films

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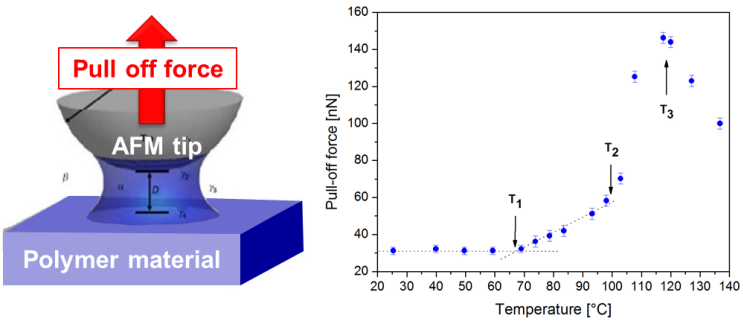
Résumé :

Aside from the well-known glass transition temperature (T_g), several additional relaxation processes have been identified in polymer materials corresponding to different dynamic processes. Among these, a transition located at a temperature above T_g was first detected and studied by Boyer[1]. Initially highly criticized due to the techniques used to detect it and the lack of theoretical references, the existence of this transition is today confirmed by several works [2],[3]. However, methods for studying this transition remain scarce and quite difficult to implement, making it difficult to investigate its origin.



Principle of the AFM pull-off force measurement on polymer material

Here we present a new experimental approach based on Atomic Force Microscope (AFM) pull-off force measurements[4], able to clearly detect the transition above T_g. By studying the influence of M_n, polymer nature and confinement effect, we confirm that, as predicted by Boyer and other, that this transition corresponds to a rubbery-viscous transition common to several amorphous polymers [4]. We believe that this transition has a very significant impact on many applications of polymer science, such as adhesion or stability, and must therefore be considered when investigating the thermomechanical properties of amorphous polymers.

Références :

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