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Self-Adhesion of uncrosslinked elastomers using a probe method

REGIS SCHACH, COSTANTINO CRETON, ESPCI, Paris — Relatively few studies have been carried out on the adhesion between uncrosslinked elastomers. A key experimental obstacle for the understanding of this problem is the separation of the surface and the bulk contributions to adhesion for such highly deformable and viscoelastic materials. A modification of the probe tack experiment used in the Pressure Sensitive Adhesive industry allows us to study the self-adhesion of elastomers with a very good control of the experimental parameters (contact time down to 1s, pressure of contact, debonding velocity). A video acquisition also allows the detailed analysis of the debonding mechanisms. We present here results on the self adhesion of three SBR Rubbers with the same microstructure (20% styrene, 42% vinyl, 19% cis and 19% trans, Mw/Mn lower than 1.1) but with different molecular weights (80 000, 160 000 and 240 000 g/mol). We observed different debonding mechanisms depending on the time of contact, the debonding velocity and the polymer used. We found that these different fracture behaviours are directly related to the bulk rheology of the polymers, especially their reptation time. Finally, we propose a map of the mechanisms as a function of two reduced parameters, the ratio of contact time to reptation time and the Deborah number.

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