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Influence of large strain rheology on the peeling performances of Pressure Sensitive Adhesives RICHARD VILLEY, MATTEO CICCOTTI, COSTANTINO CRETON, Laboratoire SIMM, CNRS, ESPCI ParisTech, Université Pierre et Marie Curie, PSL Research University, Paris, France, PIERRE-PHILIPPE CORTET, Laboratoire FAST, CNRS, Université Paris-Sud, Orsay, France, DAVID J. YARUSSO, 3M Company, 3M Center , 230-1D-15, St. Paul, MN, 55144-1000, USA — The dependence of adhesion energy of Pressure Sensitive Adhesives (PSA) on peeling velocity reduces to a master curve using a time-temperature superposition principle, usually verified by the linear rheology of polymers. This result has guided models predicting peeling energy of PSA to consider the small strain rheology of the glue only, despite it can experience very large strains before debonding. The argument of the time-temperature superposition principle can actually also be applied to large strains and is thus not a stringent one. To clarify the role of large strain rheology during the peeling of PSA, we present experiments on commercial and custom-made tapes supplied by 3M Company. Small and large strain rheology differences are obtained by changing the glass transition temperature, the cross-linking density and the density of entanglements, yet remaining close to commercial PSA. The rheology influence is decoupled from geometrical effects, by examining the nontrivial dependence of the adhesion energy on the peeling angle. Finally, adhesion energy measurements and visualizations of the process zone, over a large range of peeling velocities, are discussed, in the perspective of building a model for the adherence considering the complete rheology of the glue.

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