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Time and Temperature Dependent Adhesion in Viscoelastic Materials LEWIS LEA, NICHOLAS TAYLOR, DAVID WILLIAMSON, University of Cambridge — An experimental method is presented for studying the interfacial strength between constituent materials in polymer bonded composites. Macroscopic spherical caps of filler material are loaded into compression against a half-plane of the polymer matrix material, and then unloaded through tension and subsequent adhesive breakdown. The entire experiment is contained in an environmental chamber, temperature variations are achieved through a combination of liquid nitrogen cooling and resistive air heating, tuned using an environmental controller. The displacement of the spherical cap, contact force and contact surface are all directly empirically measured. The measured work of adhesion required to separate the two surfaces is related to the thermodynamic work of adhesion scaled by a factor due to mechanical loss during debonding. In a viscoelastic material the measured work of adhesion is therefore expected to be both rate and temperature dependent. Recent results are presented on experiments relevant to high fill fraction particulate composites with polymer matrices. Particular attention is paid to the interplay between deboning rate and temperature for viscoelastic materials, and the extension of the technique to a variety of loading profiles.

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