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Adhesive Measurements of Polymer Bonded Explosive Constituents using the JKR Experimental Technique and Finite Element Modelling of Viscoelastic Adhesive Contact NEIL HAMILTON, DAVID WILLIAMSON, University of Cambridge, DANIEL LEWIS, ANNETTE GLAUSER, AWE, ANDREW JARDINE, University of Cambridge — It has been shown experimentally that under many circumstances the strength limiting factor of Polymer Bonded Explosives (PBXs) is the adhesion which exists between the filler crystals and the polymer matrix. Experimental measurements of the Work of Adhesion between different binders and glass have been conducted using the JKR experimental technique; a reversible axisymmetric fracture experiment in which the area of contact and the applied force are both measured during loading and unloading of the interface. The data taken with this technique show a rate dependence not described by the analytical JKR theory, which considers only elastic bodies, that arises from the viscoelastic properties of the bulk polymer. To understand and describe the effects of viscosity on the adhesive measurements a finite element model (ABAQUS) of the idealized geometry used in the JKR experiment has been constructed. It is intended to bridge the gap between the purely elastic analytical JKR theory and the viscoelastic experimental results. Together, the experimental data and the computational model are intended to inform the development, and validate the predictions of, microstructural models of PBX deformation and failure.

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