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Study of soft material blast mitigation effects using a shock tube DANYAL MAGNUS, Department of Physics, Imperial College London, DAVID R. SORY, Dept of Physics; Centre for Blast Injury Studies, Imperial College London, JAMES LEE, Department of Physics, Imperial College London, MANSOOR KHAN, Department of Surgery and Trauma, Imperial College London, WILLIAM PROUD, Department of Physics, Imperial College London — Trauma inflicted by explosions can result in highly complex blast injury profiles that remain poorly understood. The extensive injury pathophysiology includes primary injuries, inflicted by the propagation of the blast wave, and secondary injuries, caused by ballistic impact. The latter threat may be effectively diminished by conventional personal protective equipment. However, mitigation of primary injuries to critical gas-containing structures, especially the lungs and gastro-intestinal tract, by lightweight armour practical for personal use has received relatively less attention. In this study, the blast mitigation performance of soft polymers and hydrogels in both homogenous and cellular form were investigated under differing loading conditions. Following mechanical characterisation, samples were loaded using a 60 mm air-driven shock tube to generate blast waves with peak pressures ranging from 200 to 800 kPa. The effect of rigid and intermediate strength, represented by a biofidelic gelatine tissue simulant, rear boundary conditions were considered in addition to the influence of an air gap between the sample and rear surface. The resulting mitigation or enhancement of peak pressure and impulse were measured.

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