

EFFECT OF STRAIN-RATE ON THE DEFORMATION BEHAVIOR OF GELATINS AND SOFT TISSUES

Tusit Weerasooriya¹, Paul Moy¹ and Wayne Chen²

¹Army Research Laboratory, Aberdeen Proving Ground, Maryland

²Purdue University, School of Aeronautics & Astronautics and School of Materials Engineering,
West Lafayette, Indiana

Dynamic mechanical responses of biological tissues and tissue simulants are important to accurately simulate blunt impact and/or bullet penetration into these soft materials. In this type of scenario, soft material deforms and fails under high strain rates. Therefore, it is essential to obtain deformation and failure behavior at high rates for these materials. However, the high rate behavior of these materials are not well understood due to the inability of conducting valid experiments at these rates. There are many challenges to overcome during high rate testing of soft materials. In this paper, novel techniques are developed to conduct high rate experiments on a split-Hopkinson pressure bar (SHPB) for soft materials. The application of these techniques to study the deformation behavior of ballistic gelatins, other tissue simulants, and swine tissues are presented and also, the strain rate effect on the deformation behavior of these materials are compared in this paper.