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The Hugoniot and Strength of Ultem 1000 Polyetherimide CHRISTOPHER NEEL, LALIT CHHABILDAS, US Air Force Research Laboratory — Parallel-plate impact studies using a single stage powder gun have been performed to investigate the shock and subsequent release behavior of the commercial polyetherimide polymer Ultem^{TM} up to 14 GPa. Two different types of setups were used to observe both the shock and unloading behavior. In one setup, the unloading was continuously tracked, and in the other the unloading was inferred from observing stress wave reverberations in a metallic plate on the sample. The results from the two methods concerning the loading behavior agreed very well and the resulting Hugoniot was found to be U_S =2.42+1.601*U_P. This study also demonstrated that the metallic plate reverberation method of following the unloading response, though not observing the continuous unloading of the sample, agrees extremely well with the unloading response recorded using continuous data obtained using interferometry windows. The results are used to build a case that the strength τ of Ultem when shock loaded to 1-8 GPa is $\sim$0.05 GPa. Furthermore, an investigation of the ratio of the release wave velocity to the shock wave velocity indicates that a transition to bulk liquid (no strength) behavior is not achieved until Hugoniot strains exceed 0.35 for amorphous polymers such as Ultem.

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