

31-19 Spall Fracture of Explosively Impacted 2024 and 7075 Al Alloy Measured Utilizing a Laser Interferometer

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Spall tests for aluminum alloys are conducted using a testing apparatus developed applying wire-row explosion technique, where one-dimensional triangular-shaped stress waves can be generated in the plate specimens of Al 2024 and Al 7075 by direct explosive loadings of PETN. A laser interferometry system is adopted to observe the free surface-velocity history of the specimen as an in-situ measurement of spalling failure. Some of the VISAR signals reveal the existence of explicit spall, which produces rather thick spall layer with prior crack-growth and void-collapse region near the surface. Other signals show the spalling type of damage accumulation near the surface. The signals indicate the effect of the PETN thicknesses and the differences of strength for both alloys. One and two-dimensional code are used to evaluate damage models and simulate damage of an entire area of the specimen respectively. The comparison with experimental data suggests the requirement of more sophisticated damage models and practical estimation of detonation pressure.

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