34−26 Explosively Produced Spallation in Metals and Its Loading Effects

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Dynamic fracture experiments are conducted for metal plates of A12024, A17075 and SUS304, where the one-dimensional triangular-shaped tensile stress wave is generated producing spall in the specimens by the direct incidence of plane detonation wave of the explosive PETN. The VISAR system is adopted to observe the free-surface velocity history of the specimen. The experimental signals indicate the characteristics of the failure for three tested materials and the effects of loading variations due to the thickness changes of the explosives and the specimen plates, and also reveal two types of demage patterns for A12024. One and two-dimensional hydro codes are applied to simulate the experimental signal data numerically, and the comparison recommends the damage accumulation model and the concept of effective thickness for the explosive in practical calculations. Finally in order to the applicability of the damage model, plate impact tests for spallation are performed measuring the free-surface velocity for A17075, where the target plates are loaded under quite different conditions from explosively generated spallation. The calculations reproduce the velocity signals of both types of plate impact tests using the damage accumulation and stress criterion models.

(Proc. of the 4th Int. Symposium on Impact Engineering, 2001-7, pp.851-856.)