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Prediction of fragmentation of an aluminum expanding ring ANDREW RUGGIERO, NICOLA BONORA, DOMENICO GENTILE, GIANLUCA IANNITTI, GABRIEL TESTA, ROBERTO DI STEFANO, University of Cassino and SL — The fragmentation behavior of solid is important in a wide range of industrial and military applications. After Niordson, the electromagnetically launched expanding ring proved a useful technique for investigating tensile fracture and fragmentation at high strain rate and the method was largely exploited by many authors. Recently, Zhang and Ravi-Chandar reported the details of the experimental observations on Al 6061-O. In the present work, two approaches were used for predicting the fragmentation response in these tests. The first is an energy based fragmentation model derived from the Gradys theory. The method, already applied to cold drawn pure copper, adopts the dynamic crack tip opening displacement as the fracture parameter that allows accounting for plastic strain occurring prior fracture. The second is a Continuum Damage Mechanics approach. Numerical simulations of the rings expansion were performed through finite element method taking care to apply proper boundary conditions. The Lorentz force was calculated by imposing the measured currents and providing the inductances values as a function of the ring geometry. To predict the material failure, the Bonoras damage model was applied, considering a statistical variation of material parameters within the rings volume.

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