

Abstract Submitted
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Dynamic Failure Mode Transitions in 7075Al Expanding rings driven by Electromagnetic loading MINGTAO LIU, TIEGANG TANG, ZHAOLIANG GUO, CHENG FAN, Institute of Fluid Physics, China Academy of Engineering Physics, Mianyang 621900, Sichuan, China — Dynamic failure mode transitions are observed in 7075Al electromagnetic expanding rings with a typical size of 3mm in thickness and 0.5mm in height. The rings are driven to maximum expanding velocities ranged from 60m/s to 180m/s, corresponding to strain rates of about 3000 to 9000 per second. At lower strain rates, the fractures of the rings are dominated by the hoop tensile stress, and the cracks are along the radial direction. At higher strain rates, the fractures of the rings are dominated by the maximum shear stress, and the cracks are lie along with an angle of about 45 degree with the radial direction. While the rings deform at medium strain rates, a mixed failure mode is observed, which simultaneously consists of tensile fracture and shear fracture. The failure strains of the specimen and the numbers of the fragmentations were measured after testing. The failure strains show a maximum value as the strain rate increasing, but the numbers of the fragmentations increase firstly, then decrease and then increase again. These phenomena were found to have a close relationship with the dynamic failure mode transitions.

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