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Multi diagnostic experiment to access striction phenomena analysis of copper structure under dynamic expansion C. VOLTZ, Commissariat à l'Energie Atomique, CEA Valduc, 21120 Is sur Tille, France, J.-M. LAGRANGE, G. BESNARD, Commissariat à l'Energie Atomique, CEA Ile de France, 91680 Bruyères le Châtel, France, B. ETCHESSAHAR, Commissariat à l'Energie Atomique, CEA Moronvillers, 51490 Pontfaverger, France — When a structure is submitted to expansion, thinning occurs until fracture appears. Some tens of microseconds before destruction, localizations of deformation are created which induces local variations of thickness and mechanical striction. According to this phenomenon, we have studied the behavior of a copper cylinder under quasi-plane deformation constraint. Nitro methane explosive driven apparatus achieves the dynamic expansion. To acquire pertinent information about the mechanical behavior, we have conducted a dynamic expansion experiment with different kind of diagnostics. With the interferometry we monitor the free surface velocity for particular locus. We use two high-speed framing cameras. The first one is set to obtain phenomenological views of the experiment (surface aspect, expansion shape, plastic instabilities and fracture) and the second one is devoted to 3D surface evolution and displacement fields measurements by the stereovision technique. To access to the residual thickness, at given time, we associate flash X-Ray imaging. All these diagnostics are operated in the same experiment. This paper describes the experiment and associated measurements results. We present numerical simulation of the expanding shell related to velocimetry, stereovision and the analysis of X-ray films. The results are discussed according to the mechanical loading of the different parts of the specimen.

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