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A micromechanical modeling approach to describe the dynamic spalling of ceramic materials BENJAMIN ERZAR, GAEL LE BLANC, FREDERIC MALAISE, ERIC BUZAUD, CEA/DAM — Subjected to a dynamic traction, a ceramic material will eventually fail as a consequence of the triggering, propagation and coalescence of a distribution of microcracks. The DFH (Denouald-Forquin-Hild) anisotropic damage model considered in this study is based on a description of three physical phenomena activated all along the fragmentation process occurring in brittle materials. The first one concerns the activation of the population of pre-existing defects distributed in the material, described by a Weibull law. The second one corresponds to the propagation of microcracks at a constant velocity. The last one is the so-called occultation phenomenon. It is based on the observation that in the vicinity of a crack, tensile stresses are relaxed, hence precluding the triggering of another crack in the same direction. The performance of DFH model has been assessed with the aim of improving the modeling of damage associated to spalling in ceramic materials. Dynamic tensile loadings have been performed in a range of high strain rates. The characteristics of resulting damage patterns observed experimentally have been accurately reproduced by means of three-dimensional Lagrangian calculations.

Eric Buzaud
CEA/DAM

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