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Multiscale Modeling of the Onset of Void Coalescence in Dynamic Fracture ROBERT E. RUDD, EIRA T. SEPPALA, JAMES BELAK, Lawrence Livermore National Laboratory — In dynamic fracture of ductile metals, voids nucleate, grow and coalesce to form the fracture. Previously, we have studied the nucleation and growth process for voids at the nanoscale in a variety of FCC and BCC metals. Here we investigate the coalescence process. Coalescence is important because it initiates accelerated void growth leading rapidly to failure. Using large-scale parallel molecular dynamics (MD) simulations, we have characterized the coalescence through the void volume and shape, the concomitant dislocation activity, and the rate of impingement of the void surfaces. We find that the onset of void coalescence takes place when the separation between the voids, the inter-void ligament distance, is equal to one void radius. We compare the material flow in the MD simulations to that in continuum models of void coalescence. [1] E. T. Seppälä, J. Belak, and R. E. Rudd, to appear in Phys Rev Lett (2004). Acknowledgment: This work was performed under the auspices of the US Dept. of Energy at the Univ. of California/Lawrence Livermore National Laboratory under contract W-7405-Eng-48.

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