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Shock recompression of spall damage DAVID JONES, SARYU FENSIN, Los Alamos National Laboratory, ROBERT HIXSON, Mission Support and Test Services — Dynamic loading of a material often results in spall fracture. When a material subjected to shock compression is allowed to release, rarefaction waves propagate into the material. If two rarefactions intersect, they can create a region of high-rate tension, generating damage through a series of void nucleation, growth, and coalescence (in ductile materials). As shock loading is closely linked to the aerospace and defense fields, it is important to understand how a damaged material will respond to a second dynamic loading event. Here, we investigate the effect of a second shock applied to pre-damaged copper that contains incipient spall damage (i.e. voids that have not yet coalesced). Flyer-plate impact experiments are used to first generate samples containing spall damage, which are then thoroughly characterized. These samples are then subjected to a second flyer-plate impact to examine how the shock interacts with the spall region. The double-shocked samples were sectioned to reveal that at relatively modest shock stresses of 2GPa the pre-existing spall damage is completely recompacted. Electron microscopy shows that the voids are compacted with enough energy to drive localized recrystallization, effectively welding the material back together to a fully dense state.

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