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The effect of peak stress (3.0 GPa to 20.0 GPa) on the spallation of lean duplex stainless steel[1] JUAN PABLO ESCOBEDO, ALI AMERI, School of Engineering and IT, UNSW Canberra, Australia, MANNY GONZALES, Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright-Patterson AFB, OH 45433, USA, HONGXU WANG, RAYMOND MILLER, PAUL HAZELL, School of Engineering and IT, UNSW Canberra, Australia, ZAKARIA QUADIR, Microscopy and Microanalysis Facility (MMF), Curtin University, Perth, Australia — This study examines the dynamic fracture behaviour and spall strength of a high hardness armour (HHA) steel and an improved rolled homogenous armour (IRHA) steel. Flyer plate impact tests were conducted at about 240 and 500 m/s, which provided peak stresses of 4.5 GPa, which caused incipient damage, and 10 GPa which resulted in full spall. Free surface velocities were measured by Photon Doppler Velocimetry (PDV) and the damage examination was conducted by conventional light optical microscopy (LOM) and scanning electron microscopy (SEM). Results show that HHA specimens exhibited about 10% higher spall strength and Hugoniot elastic limit (HEL) than IRHA specimens at the same peak compressive stresses. Post-mortem examinations revealed that the HHA steel exhibits brittle fracture indicated by shear banding seen on the fracture surface and crack propagation through the thickness. In contrast, a more ductile fracture indicative of void growth and coalescence fracture mechanisms, was observed throughout the fracture surface of IRHA.

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