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Flyer plate impact tests to investigate the spall fracture of two armor steels HONGXU WANG, SIMON HIGGS, ALI AMERI, School of Engineering and Information Technology, The University of New South Wales, MANNY GONZALES, Materials and Manufacturing Directorate, Air Force Research Laboratory, BRODIE MCDONALD, Defence Science and Technology Group, Australia, PAUL HAZELL, ZONGJUN LI, JUAN ESCOBEDO-DIAZ, School of Engineering and Information Technology, The University of New South Wales — This study examines the dynamic fracture behavior and spall strength of a high hardness armor (HHA) steel and an improved rolled homogenous armor (IRHA) steel. Flyer plate impact tests were conducted at about 240 and 500 m/s, which provided peak stresses of 4.5 GPa that caused incipient damage, and 10 GPa which resulted in full spall, respectively. 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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