Shock response of boron carbide based composites infiltrated with magnesium alloys  

MATHAN KAFRI, MOSHE DARIEL, NAHUM FRAGE, Department of Material Engineering, EUGENE ZARETSKY, Department of Mechanical Engineering, Ben-Gurion University of the Negev — The fully dense composites were obtained by vacuum infiltrating the boron carbide compacts (80% green density) with liquid AZ91 magnesium alloy (850 °C) and with the melt of 50/50 AZ91-silicon mixture (1050 °C). The densities, the elastic moduli and the Vickers hardness values of the obtained composites were, respectively, 2.44 g/cm$^3$ and 2.54 g/cm$^3$, 300 and 350 GPa, and 1200 and 1800 HV. The impact response of the composites was studied in a series of VISAR -instrumented planar impact experiments with velocities of W and Cu impactors ranged from 100 to 1000 m/s. It was found that velocity histories recorded for the composites produced by infiltration with Mg-Si alloy contain a distinct elastic precursor front followed by a plastic ramp. On the contrary, the velocity histories of the composites infiltrated with AZ91 do not display any step-like front; the amplitude of the elastic wave grows gradually from zero level and transforms smoothly into the plastic front. The influence of the composites microstructure on the compressive elastic-plastic behavior and on the dynamic tensile (spall) strength is discussed.

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