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the paper presents the crack in the glass fiber reinforced polypropylene (gfrp) composites by an experimental approach. the gfrp composite was designed and built for shock absorbance testing with a high open-cell structure. in order to reduce the heat transfer during the experiment, the polyethylene (pe) sheets were placed between the heat sink and the exposed gfrp composite panel. the experimental result shows that heat transfer through the interface of pe-gfrp is very high, which resulted in a significant increase in the thermal stress concentration. the gfrp open-cell structure was designed and manufactured to reduce the heat transfer during the experiment. the crack pattern in the gfrp panel was analyzed and based on the experimental result, and the crack was successfully predicted using a numerical model for shock absorbance testing. the paper explains the role of impactor size, impletion direction and impletion velocity on the ballistic impact response of rock filled with 8 in. x 10 in. diameter concrete. the results are obtained from finite element simulation using an 8 in. diameter disk impactor that is 3 in. shorter than the specimen width at a 90 degree angle to the specimen depth of 2 in. as a result of numerical simulations on eight specimens, it is observed that the average maximum stress, strain energy, displacement energy and strain energy density increase nonlinearly with impact velocity. for the majority of the impact scenarios, peak stress occurs and damage spreads in the surface layers of the rock, leading to superficial micro-cracks which initiate the delaminations and voids. the central layers of the rock withstand the impact to a much smaller extent, leading to damage confined to the interior.

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Vallis [16] discussed the mechanical behavior of metallic and concrete systems under impact loading. The formulation of the model was based on the discrete element theory and finite element numerical analysis. It is also noticed that the damage of the structure increases with the increased thickness of the concrete materials. Xu and Xiao [17] used a finite element code to simulate the impact of hemispherical projectiles on the reinforced concrete plates. They found that the failure of reinforced concrete plates is mainly due to the cracking of the concrete matrix rather than the failure of the steel. The increasing of the concrete thickness will reduce the failure initiation energy of the concrete, but will increase the failure initiation energy of the steel. A repeated drop test is conducted by Gomez et al. This study examined the effects of post-formation heat treatment on the flexural fatigue performance of a high strength/modulus (HP-Titan) Ti-6Al-4V alloy, a commercial Ti-6Al-4V alloy, and a combination of both alloys. Fatigue tests were conducted at various strains to investigate the difference in fatigue damage evolution between alloys. From the results, the Ti-6Al-4V alloy was found to have the lowest fatigue damage accumulation for all strain amplitudes. The HP-Titan alloy demonstrated fatigue damage accumulation only after the strain was increased to -200 με, with lower damage accumulation at increasing strains. The combined HP-Titan alloy had lower fatigue damage accumulation than that of the HP-Titan alloy alone at any given level of strain. The failure mode for the combined alloys was brittle fragmentation at approximately 200 με, whereas for the HP-Titan alloy, it was partial crack growth and interface debonding with fracture at -200 με. When combined with HP-Titan alloy, the commercial alloy provided a considerable improvement in fatigue life. This improvement was attributed to the modification of the HP-Titan alloy in the HP-Titan/commercial alloy combination, which improved the fatigue crack initiation resistance of the commercial alloy and reduced the failure mode of the HP-Titan alloy from brittle fracturing to ductile fragmentation of the HP-Titan/commercial alloy combination.
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