

Experimental Study on Dynamic Compressive Behaviors of Sand under Passive Confining Pressure.

Abstract template for China Rock 2024

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摘要: Dynamic compressive tests of sand under passive confining pressure were carried out using a Split Hopkinson Pressure Bar (SHPB) setup. The dynamic response, energy dissipation and particle-breaking behaviors of sand subjected to high-speed impact were investigated. Sand specimens with moisture contents of 0%, 2%, 4%, 8%, 10% and 12% and relative densities of 0.1, 0.5 and 0.9 were prepared. The variation in the strain rate was controlled between 90 s⁻¹ and 500 s⁻¹. The specimens were confined in a designed sleeve to create passive confining pressure. The experimental results show that the sand specimens were extremely sensitive to the strain rate. When the strain rate was less than 400 s⁻¹, the stress and strain of the specimens increased with the increase in the strain rate but decreased when the strain rate exceeded 400 s⁻¹. The peak strain and peak stress increased with the increase in the relative density. Particle breakage was aggravated with the strain rate increase. Compared with the specimen without water, the relative breakage rate of the specimen with a moisture content of 12% decreased by 30.53% when the strain rate was about 95 s⁻¹ and by 25.44% when the strain rate was about 460 s⁻¹. The analysis of energy dissipation revealed the essential cause of sand destruction. The specific energy absorption rate increased with the increases in the initial relative density and moisture content.

关键词: sand; dynamic compressive behaviors; passive confining pressure; impact dynamic; response; particle breakage; SHPB