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Influence of desert sand on the mechanical properties of concrete subjected to impact loading**

Liu Haifeng[1*] Ma Jurong[1] Wang Yiying[1] Ning Jianguo[2]
([1]School of Civil and Hydraulic Engineering, Ningxia University, Yinchuan, Ningxia 750021, China,
[2]State Key Laboratory of Explosion Science and Technology, Beijing Institute of Technology, Beijing100081, China)

Abstract: A74-mm-diameter Split Hopkinson pressure bar was used to carry out the dynamic compression experiment of concrete made of desert sand. The dynamic failure processes of concrete different in specimen size, impact velocity, desert sand replacement ratio, size and volume content of coarse aggregate were simulated. Research results showed that concrete made of desert sand had size-effect and was rate-dependent. The peak stress of concrete made of desert sand declined with the minimum size of coarse aggregate. However, the peak stress of concrete made of desert sand increased first, and then declined with the volume content and maximum size of coarse aggregate.

Keywords: concrete; desert sand; mechanical properties; impact loading

1 Introduction

With low cost and local raw material, concrete is widely used in civil engineering and national defense construction. These concrete structures are subjected to not only normal design loading, but also explosion, impact loading and earthquake. The mechanical properties of concrete subjected to dynamic loadings are different from those of concrete under static loadings. It is necessary to investigate the dynamic mechanical properties of concrete to better design and analyze these concrete structures [1-2].

Currently, many researchers have focused on the dynamic mechanical properties of concrete. On the basis of experimental results, Abrams [3] firstly found that concrete was rate-dependent. Yan [4] studied the influence of strain rate on strength, deformation and failure mode of concrete. Liu [5] carried out the dynamic uni-axial compression test and analyzed the influence of strain rate on the strength and deformation of concrete. Liu [2,6] researched the mechanical properties and constitutive model of concrete subjected to impact loadings. Numerical simulation is one of the means to study the mechanical properties and failure mode of concrete. Many models such as random particle model [7], lattice model [8], MH model [9], random mechanical model [10] and random aggregate model [11] have been put forward to simulate the mechanical properties of concrete. On the basis of random aggregate model, Du [12] studied the mesoscopic failure mechanism of concrete subjected to impact loadings. Liu [13] researched the influences of specimen size, impact velocity, size and volume content of coarse aggregate on the mechanical properties of concrete. Concrete being considered as three-phase composite consists of coarse aggregate, cement mortar and the interface between them, Lü [14] simulated the failure process of concrete under dynamic loadings by means of ABAQUS

*Corresponding author. Email: liuhaifeng1557@163.com
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