

论文

冲击速度对煤岩破碎能量和粒度分布的影响

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摘要:

为研究冲击速度对煤岩破碎能量、粒度分布的影响, 根据断裂力学理论建立了煤岩冲击破碎断裂耗能的计算表达式, 并建立了煤岩冲击破碎粒度的威布尔分布表达式, 以此为基础, 研究冲击速度对煤岩破碎能量和粒度分布规律的影响。利用冲击破碎实验台对不同冲击速度的煤岩进行破碎实验, 结果表明: 冲击速度对煤岩破碎粒度的分布规律影响较小, 威布尔分布表达式可以很好的表征不同冲击速度情况下的煤岩破碎质量累积概率, 但煤岩破碎特性指数和表征破碎程度的参数随冲击速度增大分别呈指数函数上升和下降; 煤岩冲击破碎断裂耗能和耗散能都随冲击速度的增大而上升, 煤岩冲击破碎的能量利用率随冲击速度增大而减小, 且它们之间呈指数函数关系, 能量耗散率与冲击速度也成指数函数关系, 但冲击速度越大耗散率越高。

关键词: 冲击速度; 粒度分布; 威布尔分布; 能量转化; 断裂耗能

The effects of impact velocity on energy and size distribution of rock crushing

Abstract:

In order to study the effects of impact velocity on the energy and size distribution of rock crushing, the fracture energy consumption expression of rock impact crushing was established based on fracture mechanics theory, and a Weibull distribution expression for describing the size distribution of rock impact crushing was also developed. Based on these, the effects of impact velocity on energy and size distribution were investigated. Furthermore, the experiments on rock crushing with different impact velocities were performed in the test bed of impact crushing, and the results show that impact velocity has few effects on size distribution; the Weibull distribution expression can adequately characterize the quality cumulative probability of rock crushing under different impact velocities. However, as impact velocity rises, the rock crushing characteristic index (CCI) increases at exponential speed and the rock crushing degree index (CDI) decreases also at exponential function speed. With the increase of impact velocity, the fracture energy consumption and dissipation energy of rock impact crushing all increase, but the efficiency of energy utilization decreases and the dissipative rate of energy increases at an exponential function speed.

Keywords: impact velocity; size distribution; Weibull distribution; energy conversion; fracture energy consumption

收稿日期 2012-08-24 修回日期 2012-11-06 网络版发布日期 2013-04-25

DOI:

基金项目:

江苏省高校科研成果产业化推进资助项目(JHB2011-31); 江苏高校优势学科建设工程资助项目; 江苏省博士后基金资助项目(1101106C)

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