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论文

煤巷底板岩石爆破提高瓦斯抽放率的应用与数值模拟

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摘要：

在松软煤层相邻的岩石进行深孔控制爆破时，相邻煤层也产生裂隙和振动并可提高瓦斯流量。为研究此方法与煤体爆破的差异，利用三维数值模拟结合煤矿现场爆破实验，探讨了不同爆破介质的动应力分布及抽放效果。分析了底板岩石布孔和单煤体爆破布孔的特点；建立了不同条件下的爆破模型；研究了单煤体和煤岩介质中爆破孔与控制孔连心线距离与有效应力的关系。复合介质从岩石变为煤体后，有效应力极值减小57%，相同位置单一煤体只减小27%；瓦斯抽放效果很大程度上与爆破后控制孔轴线方向有效应力分布有关，爆破孔与控制孔间距为2.0 m时，轴线方向平均有效应力与全煤层爆破3.0 m间距时基本相当。通过对重庆渝阳矿进行底板岩石深孔爆破实践，证实了以上研究结论的正确性。

关键词： 瓦斯抽放率 岩孔爆破 煤层 动态应力 数值模拟

Numerical simulation and application on blasting to improve gas drainage rate in floor rock of coal roadway

Abstract:

The gas flow increases as cracks and vibrations in coal seam are produced by the deep hole control blasting in rock adjoining soft coal seam in which drill hole was easily destroyed.In order to study the differences between blasting in rock and that in coal body,dynamic stress distributions and draining effect for different medium blasted were discussed by means of three dimensional numerical simulation method and blasting test from the coal mine.The characteristics of drilling hole patterns which blasting hole was located in single coal body and in rock media were analyzed.Blasting models on the different condition were constructed by numerical simulation.Relationships between effective stress and distance at linking line between blasting hole and draining hole were studied for single coal seam and coal rock media.The maximum of effective stress decrease 57% when the stress wave spread from rock to coal seam in the coal rock media.While it’s only 27% in the single coal seam at the same location;gas draining effect was considerably affect by distribution of effective stress along axis of controlling holes.The mean effective stress along axis of the draining hole in coal rock media,when the distance between blasting hole and controlling hole is 2.0 m,is appropriately the same as that is 3.0 m in the single coal seam.These research conclusions were validated to be correct by the deep blasting which located in rock nearby coal seam in Yuyang Coal Mine.

Keywords: gas drainage rate;blasting in rock;coal seam;transient stress;numerical simulation

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参考文献：

本刊中的类似文章

1．赵振.磁化水的理化特性及-网刊发布文章测试，文章有栏目就可以发布[J]. 煤炭学报, 2010,1(1): 1-4

2．吴荣新，刘盛东，张平松.双巷并行三维电法探测煤层工作面底板富水区[J]. 煤炭学报, 2010,(3): 454-457
3．唐志国，马培勇，俞 瑜，李永玲，邢献军，林其钊.新型干煤粉气流床气化炉的数值模拟[J]. 煤炭学报, 2010,(3): 481-485
4．刘海波，程远平，宋建成，尚政杰.极薄保护层钻采上覆煤层透气性变化及分布规律[J]. 煤炭学报, 2010,(3): 411-416
5．姜永东,阳兴洋，鲜学福,熊令,易俊.应力场、温度场、声场作用下煤层气的渗流方程[J]. 煤炭学报, 2010,(3): 434-438
6．郑力会，孟尚志，曹园，李中锋.绒囊钻井液控制煤层气储层伤害室内研究[J]. 煤炭学报, 2010,35(3): 439-442
7．卢平,袁亮,程桦,薛俊华,刘泽功,童云飞,王永,蔡如法,邓中.低透气性煤层群高瓦斯采煤工作面强化抽采卸压瓦斯机理及试验[J]. 煤炭学报, 2010,35(4): 580-585
8．杨宏民 张铁岗 王兆丰 赵长春.煤层注氮驱替甲烷促排瓦斯的试验研究[J]. 煤炭学报, 2010,35(5): 792-796
9．宋现锋 徐方舟.地层产状及高程约束条件下煤层底板 高程曲面的最佳拟合[J]. 煤炭学报, 2010,35(5): 782-786
10．韩作振，高丽华，杨仁超，樊爱萍，徐学蓓，陈金勇，刘亚南.辽河东部凹陷南段沙三上亚段沉积特征与聚煤规律[J]. 煤炭学报, 2010,35(5): 776-781
11．朱涛，张百胜，冯国瑞，张绪言，康立勋.极近距离煤层下层煤采场顶板结构与控制[J]. 煤炭学报, 2010,35(2): 190-193
12．伍永平，解盘石，任世广.大倾角煤层开采围岩空间非对称结构特征分析[J]. 煤炭学报, 2010,35(2): 182-184
13．屈先朝.瓦斯抽采孔孔距及煤层透气性的测定方法[J]. 煤炭学报, 2009,34(11): 1470-1474
14．姜福兴，王平，冯增强，王道宗.复合型厚煤层“震-冲”型动力灾害机理、预测与控制[J]. 煤炭学报, 2009,34(12): 1605-1609
15．孙云普，王云飞，郑晓娟.基于遗传-支持向量机法的煤层顶板导水断裂带高度的分析[J]. 煤炭学报, 2009,34(12): 1610-1615
