

论文

煤岩破碎失效概率的可靠性分析及分级应用

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摘要:

将煤岩破碎现象视为失效概率问题, 在应用Hoek-Brown准则建立煤岩破碎预测模型的基础上, 结合可靠性方法定义煤岩完整可靠度指标, 并提出了煤岩破碎失效概率的计算方法。根据煤岩破碎失效概率大小将破碎程度划分为破碎(A级)、较强破碎(B级)、较弱破碎(C级)、未破碎(D级)4个等级, 并确定煤岩破碎分级标准; 利用该方法分析了沁水盆地ZS-P4井井筒方向的煤岩破碎程度, 并讨论了煤岩破碎失效概率与影响因素的变化关系。结果表明, ZS-P4井煤岩破碎失效概率在0.6~1.0, 其分布形态呈顶底部煤层高、中部低的趋势; 811.4~812.0 m煤岩破碎失效概率为1(A级), 与该段煤层严重破碎实验现象吻合较好; 煤岩破碎失效概率随着水平主应力差值的增大、单轴抗压强度的降低呈非线性增长趋势。

关键词: 煤岩破碎; 失效概率; 完整可靠度; 可靠性方法; Hoek-Brown准则

Reliability analysis of coal crushing failure probability and its classification application

Abstract:

The coal crushing phenomenon can be considered as a problem of failure probability. On the basis of coal crushing prediction model established by using Hoek-Brown criterion, the coal complete reliability was defined based on reliability method, and the calculation method of coal crushing failure probability was proposed. According to the magnitude of coal crushing failure probability, four grades of A, B, C, D were divided for coal crushing degree, and the coal crushing classification standard was determined. Using the classification method, the coal crushing degree was analyzed for Well ZS-P4 in Qinshui Basin, and the relation between coal crushing failure probability and the influence factors was discussed. The results show that the coal crushing failure probability of Well ZS-P4 is among 0.6-1.0; the corresponding distribution pattern is high for roof and floor coal formation and is low for central coal formation; the coal crushing failure probability for coal formation section at depth 811.4-812.0 m is 1, which can be defined as grade A; the prediction results of coal crushing degree agrees well with experimental results observed by electron microscope; the coal crushing failure probability presents nonlinear growth relationship with horizontal principal stress difference increasing and uniaxial compressive strength reducing.

Keywords: coal crushing; failure probability; complete reliability; reliability method; Hoek-Brown criterion

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