论文

穿层钻孔水力压裂数值模拟及工程应用

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摘要：

基于煤岩体变形模型、裂缝面内流体压降模型和裂缝扩展模型及扩展准则，建立了煤岩体钻孔水力压裂数学模型，并使用ANSYS的APDL语言编程实现了该数学模型的数值求解。穿层钻孔水力压裂数值模拟结果表明：随注入压力的增大，水力压裂缝长线性增大，最大缝宽近似指数函数形式递增，压裂后期的造缝宽能力略大于造缝长能力；随压裂液黏度的增大，最大缝宽增大，缝长近似指数函数形式递减，压裂液黏度增大到一定程度后对缝长和缝宽的影响作用减弱。穿层钻孔水力压裂数值模拟结果与现场试验结果具有很好的一致性，验证了该数学模型及数值解法的正确性和适用性。

关键词：　穿层钻孔；水力压裂；数值模拟；裂缝扩展

Numerical simulation of hydraulic fracturing of crossing borehole and its engineering application

Abstract:

Based on coal rock mass deformation model，hydraulic pressure descent model in fracture，fracture propagation model and its growth criterion，the mathematical model of borehole hydraulic fracturing model of coal rock mass was established，and its numerical solution was realized using the APDL language of ANSYS.The numerical simulation results of hydraulic fracturing of crossing borehole show that fracture length presents a linear increase and the widest width increases as an exponent function with the injection pressure increases，and the ability of making fracture width is greater than fracture length during later fracturing；besides，fracture length decreases as an exponent function and the widest width increases with fluid viscosity increases，but its influential action reduces when the fluid viscosity reaches a certain extent.The numerical simulation results of hydraulic fracturing of crossing borehole is consistent with the field experiment results，thus the correctness and applicability of mathematical model and its numerical solution method are validated.

Keywords: crossing borehole；hydraulic fracturing；numerical simulation；fracture propagation

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