Theoretical Analysis of two-dimensional nonviscous Seepage through fracture considering with the surrounding rock displacement

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Abstract

There are widespread distributions and seepage of groundwater in rock fractures. Seepage conditions in the fractures can be affected by stress conditions. Theoretical model is suggested based on rock fracture seepage problem in two dimensional space. Combined with the mass conversion equation, Euler fluid flow equation and rock deformation equation the functions of seepage pressure have been deduced. The functions of seepage pressure with the surrounding rock are nonlinear second order partial differential equations of space-time. It is analyzed by differential simulation and parameters effects on seepage are presented. As the elastic modulus of rock increases, the deformation of surrounding rock becomes smaller, which indicates that the seepage in soft rock is greatly affected by the deformation of surrounding rock. The deformation of surrounding rock becomes larger with the increase of crack analysis length, which indicates that the deformation of surrounding rock has more effect in long crack seepage than in short crack seepage. With the increase of the rock width, the effect of the surrounding rock deformation on the seepage becomes smaller, which indicates that the shallower the buried depth, the greater the effect. For the initial crack scale of different scales, the smaller the initial crack, the more obvious the effect of surrounding rock deformation on seepage.

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