countries to mineral resources, especially to the difference of mining activities and other industry, so if we can, in term of different developing conditions of different countries, manage the 21st century's mining industry to incline to developing states of "post-industry", trying to make it realize the survival of the fittest and sustainable development — obviously, it is also an important project expecting to be discussed. In this paper, on the basis of the general discussion for developing state of the 21st century's mining industry, the characteristics of mining activities and its natural property, the author proposes a modeling of geological exploration for sustainable development of mining industry and decision-making system for mining activity, as well as the new "recognized intellect" for sustainable development of very shortage copper deposits.

Key words: post-industry; new economy; new recognized intellect; double control theory and reasonable zone; derivative processes; tectogenesis.

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李德威, 廖群安, 袁晏明, 易顺华

(中国地质大学地球科学学院, 湖北武汉 430074)

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Groundwater (Fluid) Flow Modeling in Fractured Rocks via Discrete Fracture Fluid Flow Approach

Wang Mingyu[1], Chen Jingsong[2], Wan Li[2]

(1. *The University of Arizona, Tucson, Arizona* 85721, *USA*; 2. *Department of Water Resources and Environmental Engineering, China University of Geosciences, Beijing* 100083, *China*)

Abstract: The continuum approach in fluid flow modeling can generally be applied to porous geological media, but has limited applicability for fractured rocks. With the presence of a complex fracture network pattern and the fluid flow restricted mainly to the fractures, the porous media assumption does not adequately describe the flow behavior in the fractured rocks. A discrete fracture flow model has the capability not only in capturing inhomogeneity and anisotropy, but also in estimating representative elementary volume (REV) and determining hydraulic conductivity tensor for fractured rocks. In this paper, the following sub-topics were discussed: (a) general discrete fracture fluid flow modeling for saturated fractured geologic media; (b) determinations of REV and hydraulic conductivity tensor for fractured rocks using a discrete fracture network fluid flow model; (c) investigations of fracture orientation effect on the hydraulic conductivity and REV using a discrete fracture network fluid flow model, and (d) the ways to treat major fractures vs. minor fractures in the 2D and 3D discrete fracture fluid flow models. The results from this investigation indicate that a discrete fracture flow model could be used to evaluate the hydraulic properties at different scales. In addition, the orientation of fractures plays an important role in determining the hydraulic behaviors in fractured rocks. Furthermore, various conceptual fluid flow models are presented to reflect the different flow features of both minor and major fractures identified in fractured rock masses.

Key words: groundwater flow modeling; fractured rock; discrete fracture fluid flow approach; representative elementary volume; hydraulic conductivity tensor; minor fracture; major fracture.

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