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岩石宏、细观损伤复合模型及裂纹扩展规律研究

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摘要 通过假设微元具有破坏、损伤和无损3种状态，损伤和破坏可以用无损的程度表示；把细观损伤理论和宏观统计损伤模型结合，建立应力－应变与微裂纹密度变化的关系；分别运用Taylor方法、广义自洽法和Taylor介质法，通过计算实例分析岩石应力－应变过程中裂纹密度的发展变化规律，讨论特征点处的裂纹密度变化特点及计算方法的影响，尝试利用细观损伤理论确定岩石残余强度，得出岩石非线性性质是裂纹密度发展速度的宏观表现等结论。

关键词 岩石力学；细观损伤；损伤统计模型；微裂纹密度；裂纹发展速度；特征点

分类号

STUDY ON MACRO- AND MESO-DAMAGE COMPOSITE MODEL OF ROCK AND CRACK PROPAGATION RULE

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Abstract

Assuming that the representative volumetric element(RVE) has three states，i.e. failure，damage and intactness. The damage can be expressed by degree of failure or intactness. The relation between stress-strain and density variation of rock crack has been obtained through the meso-damage theory and damage statistics model. By the Taylor method，the generalized consistent method and the Taylor medium method in the process of stress-strain，the variable rule of the crack density during the development process of rock stress-strain has been analyzed by examples. The variable characteristics of crack density at characteristic points and the influences of calculation methods have been discussed. Meso-damage theory is used to determine the residual strength of rock. It is shown that the nonlinearity of rock is the macroscopic behavior of development speed of crack density. Some other useful conclusions are also drawn.

Key words rock mechanics；meso-damage；damage statistics model；microcrack density；speed of crack propagation；characteristic points

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