岩石力学与工程学报 2005 (17): 3165 ISSN: 1000-6915 CN: 42-1397/O3

西原模型对岩石流变特性的适应性及其参数确定

陶 波1，2，伍法权2，郭改梅2，周瑞光2

(1. 中国石油大学(北京) 资源与信息学院，北京 102249；2. 中国科学院 地质与地球物理研究所，北京 100029)

收稿日期 2005-2-23 修回日期 2005-4-17 网络版发布日期 2007-2-14 接受日期 2005-2-23

摘要 通过对伯格斯体与西原体的对比分析，认为西原模型能模拟各种岩石流变特征，而伯格斯体仅适合用于较软岩。由于考虑到荷载与起始流变应力的关系，西原模型的本构关系用分段函数表示。当s ＜ss时，西原模型的蠕变不导致无限变形，松驰不导致应力为0；当s ≥ss时，蠕变导致无限变形，松驰也不导致应力为0。伯格斯体忽略荷载与起始流变应力的关系，认为只要有荷载作用于岩体上，就会导致无限变形，这与岩石的实际流变规律相矛盾。此外，利用三轴压缩蠕变试验结果，分别利用伯格斯模型及西原模型，运用最小二乘法对赵各庄煤矿断层破碎带灰黄色糜棱岩的流变曲线进行了拟合，并求取了流变参数。拟合结果表明，西原模型比伯格斯模型更适合于描述岩石的蠕变特性。

关键词 岩石力学；西原体；岩石流变特性；适应性；最小二乘法；流变参数

分类号

FLEXIBILITY OF VISCO-ELASTOPLASTIC MODEL TO RHEOLOGICAL CHARACTERISTICS OF ROCK AND SOLUTION OF RHEOLOGICAL PARAMETER

TAO Bo1，2，WU Fa-quan2，GUO Gai-mei2，ZHOU Rui-guang2

(1. Faculty of Natural Resources and Information Technology，China University of Petroleum，Beijing 102249，China；
2. Institute of Geology and Geophysics，Chinese Academy of Sciences，Beijing 100029，China)

Abstract

By comparison of Burgers model with visco-elastoplastic model，this paper considers visco-elastoplastic model is adaptive to all kinds of rock rheological characteristics，while Burgers model is only suitable to rather soft rock. Due to taking the relationship between s and ss into account，constitutive equations of visco-elastoplastic model are presented by segmented functions. When s ＜ss in the visco-elastoplastic model，creep never causes infinite deformation and relaxation wouldn’t result in stress disappearing. When s ≥ss，deformation caused by creeping will last all along，but stress caused by relaxation never decreases to zero. The Burgers model，regardless of relationship between s and ss，holds deformation to infinite as long as s is not equal to zero，which is contradictory to the rheological characteristics of rock.

Moreover，according to triaxial creep test of rock samples，authors fit the curve of -t of the gray-yellow miliolite from fault of Zhaogezhuang Coal Mine respectively by visco-elastoplastic model and Burgers model and obtain their rheological parameters by least squares procedure. The fitting results show that the visco-elastoplastic model is more suitable than the Burgers model to describe rock rheological characteristics.

Key words rock mechanics；visco-elastoplastic model；rock rheological characteristics；flexibility；least squares procedure；rheological parameter

DOI:

通讯作者