盐岩非线性蠕变损伤本构模型及其工程应用

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摘要　盐岩以其良好的流变、低渗透率及损伤自我恢复等特性，是目前国内外公认的能源、废弃物贮存和高放射废物地质处置的首选介质。结合金坛储气库盐岩三轴蠕变的研究成果，建立盐岩三维蠕变损伤的本构方程和损伤演化方程，并将建立的本构方程编制成有限元计算程序，模拟金坛储气库在注采过程中的蠕变和损伤演化的影响范围。研究成果对金坛储气库的运行压力设计具有一定的参考意义。

NONLINEAR CREEP DAMAGE CONSTITUTIVE MODEL OF ROCK SALT AND ITS APPLICATION TO ENGINEERING

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Abstract

Rock salt is considered as a potential medium for energy storage，nuclear waste deposit for its excellent creep，low permeability and damage recovery behaviors. Based on laboratory creep test results of rock salt，nonlinear creep constitutive model and damage evolution equation are suggested. The developed constitutive model and damage evolution equation are programmed by FEM；and comparison between laboratory data and numerical results are given. Furthermore，the numerical code is applied to the simulation of creep and damage behaviors of underground salt caverns during natural gas injection and pumping. The creep damage evolution zones of the caverns are obtained from the numerical analysis. The achievements from the research work can provide references to the design of Jintan Underground Gas Storage.

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