

层状盐岩温度应力耦合作用蠕变特性研究

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摘要 在温度应力耦合作用下, 通过对层状盐岩蠕变特性试验研究及理论分析发现: (1) 层状盐岩的蠕变率与其组分、结构密切相关, 盐岩组分、结构不同, 蠕变应变、蠕变率均不同。(2) 在常温下, 随着应力水平的增大, 层状盐岩的蠕变应变、蠕变率逐渐增大, 层状盐岩的稳态蠕变率与偏应力之间成良好的幂函数关系。(3) 在温度和应力耦合作用下, 加载应力水平相同时, 温度对层状盐岩的稳态蠕变率影响很大, 层状盐岩的稳态蠕变率与温度服从指数关系; 在同温同压作用下, 纯盐岩的横向位移、横向蠕变应变和横向蠕变率都比高盐分泥岩夹层的大, 纯盐岩的横向蠕变率是高盐分泥岩夹层的1.6~1.8倍。(4) 层状盐岩体各层之间由于组分、结构不同, 在应力和温度耦合作用下, 蠕变率不同, 应变不协调, 导致剪切破坏。最后, 通过试验数据拟合, 建立层状盐岩的稳态蠕变率本构方程, 对我国盐岩矿床中建造油气储库及稳定性分析具有一定的参考价值。

关键词 [岩石力学](#); [层状盐岩](#); [蠕变](#); [温度](#); [本构方程](#)

分类号

STUDY ON COUPLED THERMO-MECHANICAL CREEP PROPERTIES OF BEDDED ROCK SALT

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Abstract

Through coupled creep experiment and theoretical analysis of thermo-mechanical behaviors of bedded rock salt, the results are obtained as follows. (1) The creep ratios and creep strain of rock salt vary with ingredient and structural distribution. (2) Under normal temperature, the creep strain and creep ratios of bedded rock salt increase when its loading stress increases; and the steady creep ratios are with good power function of deviatoric stress. (3) Under thermo-mechanical coupling, the steady creep ratios are affected by temperature when the loading stress is the same; and the steady creep ratios of bedded rock salt are shown with exponential function of temperature. At the same temperature and stress, the transversal displacement, strain and creep ratios are larger than those of bedded salt-mudstone; the creep ratio in landscape orientation of rock salt is 1.6–1.8 times larger than that of salt-mudstone interlayer. (4) As the ingredient and structure of each interlayer of bedded rock salt are different, the creep strain is not consistent with the action of stress and temperature, and it will result in shearing failure. Finally, the creep constitutive equation of bedded rock salt is established according to fitting experimental data; and the achieved results can provide some references to the stability analysis of oil and gas storage cavern in bedded salt deposits.

Key words [rock mechanics](#); [bedded rock salt](#); [creep](#); [temperature](#); [constitutive equation](#)

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