

不同渗透压力下盐岩的渗透率测试研究

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RESEARCH ON PERMEABILITY TESTING OF ROCK SALT UNDER DIFFERENT PERMEABILITY PRESSURES

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摘要 地下盐腔被广泛应用于核废料地下处置、石油天然气地下储存和二氧化碳封存, 由于盐岩的低渗透性, 目前很难通过试验获得其渗透率。通过稳态法对3种不同成分盐岩进行渗透特性试验研究, 获得盐岩的渗透参数, 并对拟压力法和考虑克氏效应的2种渗透率计算方法的结果进行对比研究。结果表明: (1) 盐岩的渗透率与孔隙度极低, 孔隙度为0.3%~3.0%, 纯盐岩渗透为10—20 m²左右, 而含杂质盐岩渗透率更低, 为10—20~10—21 m²; (2) 对盐岩的气测渗透率进行测试, 进气压力为1~5 MPa时, Klinkenberg 效应影响明显, 当渗透力超过5 MPa后, 岩体在渗透力作用下会产生损伤, 渗透率升高; (3) 通过对比, 考虑Klinkenberg效应的方法较拟压力法在盐岩渗透率计算中更为理想。

关键词: 岩石力学 盐岩 渗透率 损伤 拟压力 克氏效应

Abstract: Rock salt cavern is widely used for nuclear waste disposal, petroleum and natural gas storage and CO₂ sequestration. The permeability of rock salt is too low to be obtained easily by experiments. The permeability of three different rock salt samples are obtained through the steady-state method. The permeability calculated by pseudo-pressure method and considering Klinkenberg effect are compared. The results show that: (1) The permeability and porosity of rock salt are extremely low, and the porosity is between 0.3% and 3%. The permeability of pure rock salt is about 10—20 m², greater than that of impurity rock salt, which is between 10—20 and 10—21 m². (2) During the permeability experiment, when the inlet pressure is 1 - 5 MPa, Klinkenberg effect is obvious. When the inlet pressure is higher than 5 MPa, the rock salt is damaged and the permeability increases. (3) By comparing the results, the method of considering Klinkenberg effect is more ideal than pseudo-pressure method in rock salt permeability calculation.

Keywords: rock mechanics rock salt permeability damage pseudo-pressure Klinkenberg effect

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