

低渗透岩石渗透率对有效应力敏感系数的试验研究

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摘要 低渗透岩石渗流过程中存在明显的流固耦合效应, 采用FDES-641驱替评价系统对采自长庆油田的砂岩岩样进行试验和分析以研究低渗透岩石渗透率与有效应力之间的关系。试验结果表明, 岩石渗透率随着有效应力的增加而呈现规律性减小。但鉴于影响岩石渗透率的渗流耦合因素很复杂, 可以通过定义渗透率对有效应力的敏感系数从而将影响因素进行归一化处理。敏感系数可以反映出岩石渗透率随有效应力的变化趋势。根据试验结果建立敏感系数与有效应力之间的函数关系, 从而把求取在不同有效应力下岩石渗透率的值转化为对其敏感系数的确定, 并据此推导岩样渗透率与有效应力的函数关系式。

关键词 [岩石力学; 低渗透岩石; 耦合渗流; 渗透率; 有效应力](#)

分类号

EXPERIMENTAL STUDY ON COEFFICIENT OF SENSITIVENESS BETWEEN PERCOLATION RATE AND EFFECTIVE PRESSURE FOR LOW PERMEABILITY ROCK

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Abstract

There exists distinct fluid-solid coupling effect during seepage in low permeability rock. Experiments upon sandstone from Changqing oil field are performed with FDES-641 triaxial system to investigate the laws between the permeability of rock and the effective pressure. It is proved by experiments that the permeability of rock will drop regularly along with the increasing of the effective pressure. With the increasing of effective pressure, the permeability of rock decreases. The variation relation between them can be described by quadratic equation. When plot curve in the reference frame with X-axis to be the effective pressure and Y-axis the permeability of rock, an inflexion of the curve exists. Before reaching the inflexion, the permeability of rock will drop more quickly but after the inflexion such dropping will become more gentle. The location of inflexion in curve will vary for different rocks. The coupling mechanism of seepage in rock mass has not been completely made clear so far; and the coupling factors affecting the permeability of rock are actually too complex to describe one by one. The coefficient of sensitiveness between the permeability of rock and the effective pressure is defined accordingly as to generalize these factors. Such coefficient can evaluate the changing trend of the permeability of rock related to the effective pressure. The higher the coefficient is, the bigger amount the permeability of rock will change along with the effective pressure. By the way the effort to determine the value of permeability can shift to the coefficient of sensitiveness. According to the numerical fitting result of experiments, the relation between the coefficient of sensitiveness and the effective pressure can be described by exponential function. The expression between the permeability of rock and the effective pressure is deduced based on the conception of coefficient of sensitiveness.

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Key words [rock mechanics](#); [low permeability rock](#); [coupling seepage](#); [permeability](#); [effective pressure](#)

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