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论文

煤岩变形力学特性及其对渗透性的控制

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摘要：

通过煤岩力学试验研究了煤岩物理力学性质和煤岩全应力-应变过程中的渗透规律。研究结果表明：煤的力学强度相对煤层顶底板岩石具有低强度、低弹性模量和高泊松比特性，易于产生塑性变形；在全应力-应变过程中具有明显应变软化现象的煤样，在微裂隙闭合和弹性变形阶段，煤岩体积被压缩，煤岩渗透率随应力的增大而略有降低或渗透率变化不大；在煤岩的弹性极限后，随着应力的增加，煤岩进入裂纹扩展阶段，煤岩体积应变由压缩转为膨胀，煤岩渗透率先是缓慢增加然后随着裂隙的扩展而急剧增大；在煤岩峰值强度后的应变软化阶段煤岩渗透率达到极大值，然后均急剧降低，峰后煤岩的渗透率普遍大于峰前。在全应力-应变过程中应变软化现象不明显或者具有应变硬化现象的煤样，煤岩全应力-应变过程中最大渗透率主要发生峰值前的塑性变形阶段，在煤岩峰值强度后的应变硬化阶段，随着煤岩应力的增大，煤岩渗透率减小，峰后煤岩的渗透率普遍小于峰前。

关键词： 煤岩变形；力学特性；渗透性；全应力-应变

Mechanical properties of coal deformation and its influence on permeability

Abstract:

By the mechanical tests of the coal samples，the physical and mechanical properties of coal and the law of permeability during the complete stress strain process were studied.It is shown that，compared with the rocks from coal roof and floor，the coal is more prone to plastic deformation with the property of lower mechanical strength，lower elastic modulus and higher Poisson’s ratio.For the coal samples which have obvious strain softening character during the complete stress strain process，first，the coal sample volume is compressed and the permeability of coal with stress increases slightly or permeability changes little in the micro cracks closure and elastic deformation stage.After the stress increases higher than the elastic limit，the coal sample gets into the crack propagation stage.The volume strain of coal changs from compression to expansion.The permeability of coal first slowly and then sharply increases with an increasing of crack extension.During the strain softening stage，the coal permeability achieves the maximum and follows by a sharp decrease.The coal permeability after the peak strength is generally greater than that before the peak.For coal samples which have little strain softening character or strain hardening during the complete stress strain process，the maximum permeability is mainly achieved in the plastic deformation stage before the peak.During the strain hardening stage after the peak strength，the permeability decreases with an increasing of stress.Commonly，the coal permeability after the peak strength is generally less than that before the peak.

Keywords: coal deformation；mechanical properties；permeability；complete stress strain

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