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受载煤体表面电位效应的实验研究

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Experimental study on surface potential effect of coal under load

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摘要

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摘要 利用建立的煤体表面电位实验系统,研究了煤体在单轴压缩、拉伸、三点弯曲等不同破坏方式下的表面电位效应特征和规律. 研究表明,煤体在受载破坏时能够产生表面电位,并且表面电位与载荷呈较好的一致性,它们之间的相关系数可达到0.6~0.9;同时,载荷的变化会引起表面电位相应的变化,表面电位信号一般随载荷的增加而增强,随载荷的降低而减弱;并且表面电位在煤样表面上的分布是随载荷增加及煤样的破坏而变化的. 通过煤体表面电位的研究,对进一步深入研究煤体破裂电磁辐射的产生机理,促进煤岩电磁辐射技术的发展和应用具有一定的作用. 同时,对于煤体表面电位的深入研究,可望为评定煤矿现场煤体应力状态及其稳定性、监测预报煤岩动力灾害提供一种新的方法和手段.

关键词 煤体, 受载破坏, 表面电位, 特征规律

Abstract: In this paper, the characteristics and rules of surface potential effect of coal are studied under different failure mode, such as, uniaxial compression, tensile fracture and three-point bending by using the surface potential experiment system. Experiment results show that surface potential can be produced in the fracture of coal, and surface potential has a good correspondence with load and the correlation coefficient between them can reach up to 0.6 to 0.9. And the change of load will induce the change of surface potential correspondingly, and the larger the load is, the higher the surface potential becomes, vice versa. The distribution of surface potential is changing along with the change of load and fracture states of coal sample. The research of surface potential has a profound significance on deep study of the mechanism of electromagnetic radiation of coal fracture, also, on promoting the development and application of coal or rock electromagnetic radiation technology. And the further research of surface potential may provide a new method for assessing stress state and its stability of coal seam in mining filed, or monitoring and forecasting coal or rock dynamic disasters.

Keywords Coal, Deformation and fracture under load, Surface potential, Characteristic and rule

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