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# 煤岩动力灾害电磁辐射预测技术中力电耦合方法的研究及应用

肖红飞<sup>1</sup>, 冯涛<sup>1</sup>, 何学秋<sup>2</sup>, 王恩元<sup>2</sup>, 朱川曲<sup>1</sup>

(1. 湖南科技大学 能源与安全工程学院, 湖南 湘潭 411201; 2. 中国矿业大学 能源科学与技术学院, 江苏 徐州 221008)

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**摘要** 对煤岩动力灾害电磁辐射预测技术的研究现状和发展趋势进行了论述与分析, 基于煤岩变形破裂电磁辐射信号与受载时应力变化之间的关系, 从FLAC应力场数值模拟与电磁辐射传播的角度对煤岩变形破裂电磁辐射力电耦合研究方法进行了研究。研究结果表明: 基于FLAC模拟的力电耦合方法能合理地确定应力集中区域以及正确模拟电磁辐射在煤岩层内的分布规律, 该方法为现场应用电磁辐射方法和技术准确预测预报煤岩灾害动力现象提供可靠的理论基础, 对于完善煤岩变形破裂电磁辐射监测和检测理论以及促进相关学科的发展具有理论和现实意义。最后还对未来煤岩动力灾害电磁辐射预测技术研究的发展前景进行展望。

**关键词** [岩石力学](#); [煤岩动力灾害](#); [预测技术](#); [力电耦合](#); [电磁辐射\(EME\)](#); [煤岩变形破裂](#)

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## STUDY AND APPLICATION OF COUPLING BETWEEN EME AND STRESS IN ELECTRO-MAGNETICAL EMISSION PREDICTION TECHNOLOGY FOR COAL OR ROCK DYNAMICAL DISASTER

XIAO Hong-fei<sup>1</sup>, FENG Tao<sup>1</sup>, HE Xue-qiu<sup>2</sup>, WANG En-yuan<sup>2</sup>, ZHU Chuan-qu<sup>1</sup>

(1. College of Energy and Safety Engineering, Hunan University of Science and Technology, Xiangtan 411201, China;  
2. College of Energy Science and Engineering, China University of Mining and Technology, Xuzhou 221008, China)

### Abstract

The present situation and progress trend of electro-magnetic emission (EME) prediction technology for rock or coal dynamical disasters are analyzed. On the basis of the relationship between EME signal and loading stress during deformation and fracture of coal or rock, the coupling methods between EME and stress are studied based on FLAC simulation for stress field and EME propagation. The results show that the coupling relationship can be expressed by thrice multinomial approximately. The electromagnetic emission signal will increase with the increase of loading stress, which approximately conforms to thrice multinomial. There are relatively large influences on the EME intensity or pulse in loading stress and loading speed. The higher the stress and loading speed are, the stronger the signal of electromagnetic emission produced is. The coupling results of calculation show that the EME signals increase with the increment of loading speed or the strength of coal or rock. The coupling method between EME and stress based on FLAC analogy can reliably ascertain the stress concentration fields, and properly simulate the distribution rules of EME signal in coal or rock

stratum. It provides a kind of new approach to electromagnetic emission monitoring technology for the purpose of the application of monitoring EME to the prediction of dynamical disaster phenomena such as coal or rock outbursts. It can also provide reliably theoretical basis for the use of EME method and technology to predict and forecast rock or coal dynamical disasters. It has important meaning for perfecting the EME monitoring and detecting theory and promoting the related disciplines. Finally, a prospect for the research on the EME prediction technology for rock or coal dynamical disaster in the future is presented.

**Key words** [rock mechanics](#); [rock or coal dynamical disasters](#); [forecast technology](#); [coupling between EME and stress](#); [electro-magnetic emission\(EME\)](#); [deformation and fracture of coal or rock](#)

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