

应用三分量地震数据反演煤系地层孔隙含水量

芦俊¹, 王赞², 赵伟^{3*}

1. 中国地质大学(北京)能源学院, 北京 100083;
2. 中国科学院地球化学研究所, 贵阳 550002;
3. 煤矿瓦斯治理国家工程研究中心, 安徽淮南 232052

Quantitative prediction of water content in porosity in coal measure component seismic data

LU Jun¹, WANG Yun², ZHAO Wei^{3*}

1. School of Energy Resources, China University of Geosciences, Beijing 100083, China;
2. Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China;
3. State Engineering Research Center of Coal Gas Control, Anhui Huainan 232052, China

摘要

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摘要 地层孔隙含水量的计算主要受地层孔隙度与孔隙含水饱和度的影响.通过实验室煤层及其顶底板岩芯物理测试与孔隙度获得煤系地层岩芯的孔隙度与岩芯纵、横波速度的经验公式;结合三分量地震勘探获得的纵波与横波速度,能够计算出煤系地层;含水饱和度的计算通过实验室岩电参数测试和阿尔奇公式可以计算得到.结合淮南某矿区三维三分量地震勘探和地球物理样的岩电试验,实现了三维空间煤系地层孔隙含水体积百分比的精确计算.该预测方法与传统的、钻孔控制的地下水评价方法提供相对精细的、三维空间的、量化的煤系地层孔隙相对含水量,对煤炭与煤层气资源开采中所涉及的地下水分布规律预测具有参考意义.

关键词: 含水量 孔隙度 含水饱和度 煤层 三维三分量地震勘探

Abstract: The calculation of water content of subsurface formations is mainly influenced by the porosity and saturation. Through laboratory tests of core samples of coal seam and its roof and floor, the relations between porosity and compressional and shear wave velocities are statistically set up. Then combined with the P-wave velocities inverted from 3-component seismic exploration, 3-dimensional porosity data of the coal seam strata are calculated. By the lithological-electrical parameters testing results and Archie Formula, the water saturation of subsurface formations is derived. With the methods above, predictions of comparative water content in three coal seams were tried in Huainan Coal Field; with the help of 3D three-component seismic data, logging and samples tests, quantitative prediction of 3-dimensional water content of the coal seam is realized. Compared with conventional methods such as borehole controlled evaluation, the new method can calculate 3-dimensional water content in a relatively fine and quantitative way, and the method may provide useful information for estimating water content distribution in coal and gas exploitation.

Keywords: Water content Porosity Saturation Coal seam 3D3C seismic exploration

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Corresponding Authors: 王赞. E-mail: wangyun@mails.gyig.ac.cn Email: wangyun@mails.gyig.ac.cn

About author: 芦俊,男,1980年生,博士后,讲师,现在中国地质大学(北京)能源学院从事三分量地震技术研究工作. E-mail: lujun615@163.com