

含吸附煤层气煤的有效应力分析

吴世跃1, 2, 赵文1

(1. 东北大学 资源与土木工程学院, 辽宁 沈阳 110004; 2. 太原理工大学 矿业工程学院, 山西 太原 030024)

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摘要 煤层中的气体(煤层气)主要呈吸附状态, 固体煤和吸附气体之间的相互作用关系是目前人们关心的问题, 它与煤矿瓦斯防治和煤层气开采有关。根据表面物理化学和弹性力学原理, 推导了煤吸附膨胀变形、吸附膨胀应力及有效应力计算公式, 理论计算结果和试验结果基本一致。分析表明, 裂隙中自由气体的压力对煤层中的应力状态影响很小, 在煤层内部吸附膨胀应力和吸附膨胀变形规律服从虎克定律。

关键词 [采矿工程](#); [含吸附煤层气煤](#); [煤的孔隙结构](#); [表面张力](#); [吸附膨胀应力](#); [孔隙气体压力](#); [有效应力](#)

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ANALYSIS OF EFFECTIVE STRESS IN ADSORBED METHANE-COAL SYSTEM

WU Shi-yue1, 2, ZHAO Wen1

(1. School of Resources and Civil Engineering, Northeastern University, Shenyang 110004, China;

2. College of Mining Engineering, Taiyuan University of Technology, Taiyuan 030024, China)

Abstract

Most of gas (methane) in coal seam is in adsorbed state. At present, the attention of researchers is attracted to the relationship of the mutual action between the solid coal and the adsorbed methane because it is closely connected with the prevention and control of the burst of coal and gas in mining and the exploitation of methane. Terzaghi's effective stress formula can not be adapted in the calculation of the effective stress in adsorbed methane-coal system. Therefore, based on

principles of surface physicochemistry and elastic mechanics, the calculation formulas on the swelling deformation of adsorption, the swelling stress of adsorption, and the effective stress in the adsorbed methane-coal system are derived. The computation solution of theory is essentially accordant with the experimental solution. The test and analysis show that the mechanical effect of the free gas pressure in pore is less important to coal seam because the porosity of coal is smaller than the porosity of soil by an order of magnitude, and that the changing law between the swelling strain of adsorption and the swelling stress of adsorption agrees with the Hooke's law because micropore-containing solid matrix of coal grains is separated by crevices discontinuously; and the swelling deformations of contact points of coal grains under constraint condition are similar to that in uniaxial compression

Key words [mining engineering](#); [adsorbed methane-coal system](#); [pore structure of coal](#); [surface tension](#); [swelling stress of adsorption](#); [pore gas pressure](#); [effective stress](#)

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