

论文

淮北煤田芦岭矿区次生生物气地球化学证据及其生成途径

佟莉, 琚宜文, 杨梅, 侯泉林, 张文静, 房立志, 颜志丰

- 1.中国科学院计算地球动力学重点实验室, 北京 100049;
- 2.中国科学院大学 地球科学学院, 北京 100049

摘要:

从煤储层甲烷碳氢同位素组成、甲烷与水的氢同位素值的定量关系、煤层气田产出水的来源3个方面探讨了淮北煤田芦岭矿区煤层气的成因, 结果表明: 煤层气组分中甲烷气占绝对优势(达97%以上), 且明显显示出极干气的特征; 甲烷碳和氢同位素值范围分别为-67.6‰~-64.2‰, -206‰~-224‰, 属于生物成因气的分布范围; 甲烷氢同位素值($\delta D(CH_4)$)和水氢同位素值($\delta D(H_2O)$)定量关系表明, 煤层甲烷气主要是二氧化碳还原作用生成的次生物成因气; 煤层水样品点同位素值均落在大气降水线附近, 说明煤层水的主要来源为大气降水, 符合生物成因气生成需有雨水补给的条件。综合3个方面定性和定量分析结果, 并结合研究区构造-热演化史, 认为现今淮北煤田芦岭矿区的煤层气主要为次生物成因气。

关键词: 煤层气成因; 次生物气; 碳氢同位素; 氢氧同位素; 淮北煤田

Geochemical evidence of secondary biogenic and generation approach in Luling Coal Mine of Huaibei coalfield

Abstract:

Discussed the origins of coalbed methane in Luling Coal Mine of Huaibei coalfield from the aspects of carbon and hydrogen isotope of methane, the quantitative relationship between $\delta D(CH_4)$, $\delta D(H_2O)$ and the source of coalbed produced water. The results reveal that the methane is predominant (up to 97%) and is thought as extremely dry. $\delta^{13}C(CH_4)$ from -67.6‰ to -64.2‰ and $\delta D(CH_4)$ from -206‰ to -224‰, so it is in the range of biogenic gas. Quantitative relationship between $\delta D(CH_4)$ and $\delta D(H_2O)$ indicates that the methane mainly generated by carbon dioxide is biogenic methane. Hydrogen and oxygen of water sample falls near the meteoric water line, indicating they are all from precipitation, so it meets the condition of water supply for generation of biogenic methane. Therefore, integrating the above three aspects of qualitative and quantitative analysis and the history of tectono-thermal, that the extant methane is secondary microbial origin in Luling Coal Mine of Huaibei coalfield is concluded.

Keywords: origins of coalbed methane; secondary biogenic gas; carbon and hydrogen isotope; hydrogen and oxygen isotope; Huaibei coalfield

收稿日期 2012-01-18 修回日期 2012-03-27 网络版发布日期 2013-03-05

DOI:

基金项目:

国家科技重大专项资助项目(2011ZX05060-005); 国家自然科学基金资助项目(41030422, 40972131); 中国科学院战略性先导科技专项资助项目(XDA05030100)

通讯作者: 佟莉

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作者简介: 佟莉 (1985—), 女, 河北唐山人, 硕士
作者Email: tongli12042009@163.com

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