岩石学报
ACTA PETROLOGICA SINICA

王丽波,久凯,曾维特,付景龙,赵松. 2013. 上扬子黔北地区下寒武统海相黑色泥页岩特征及页岩气远景区评价. 岩石学报, 29(9): 3263-3278

上扬子黔北地区下寒武统海相黑色泥页岩特征及页岩气远景区评价

作者	单位
王丽波	中国地质大学资源学院, 武汉 430074;东北石油大学, 大庆 163318
久凯	海相储层演化与油气富集机理教育部重点实验室, 中国地质大学, 北京 100083;页岩气勘查与评价国土资源部重点实验室, 中国地质大学, 北京 100083
曾维特	海相储层演化与油气富集机理教育部重点实验室, 中国地质大学, 北京 100083;页岩气勘查与评价国土资源部重点实验室, 中国地质大学, 北京 100083
付景龙	海相储层演化与油气富集机理教育部重点实验室, 中国地质大学, 北京 100083;页岩气勘查与评价国土资源部重点实验室, 中国地质大学, 北京 100083
赵松	海相储层演化与油气富集机理教育部重点实验室, 中国地质大学, 北京 100083;页岩气勘查与评价国土资源部重点实验室, 中国地质大学, 北京 100083

基金项目：本文受国家科技重大专项(2011ZX05018-001-002、2011ZX05009-002-205);全国油气资源战略选区调查与评价国家专项(2009GYXQ-15)联合资助.

摘要：

依据大量野外页岩实测地质剖面和2口页岩气钻井、样品岩石矿物组分分析、有机地球化学实验等大量分析测试资料,系统研究了上扬子黔北地区下寒武统牛蹄塘组黑色泥页岩的发育特征与分布,并结合北美海相页岩气形成地质条件及我国页岩气选区评价标准,预测了黔北地区页岩气勘探的有利区。结果表明:黔北地区下寒武统牛蹄塘组海相黑色泥页岩厚度大、分布广泛,早期海侵体系域水体相对较深,沉积和沉降中心位于研究区的东南部,主要的物源来自西北部,沉积相类型主要为砂质陆棚、浅水陆棚和深水陆棚相沉积,深水陆棚相分布在东南部地区,呈北西-南东向带状展布。晚期高位体系域,水体深度逐渐降低,随着相对海平面的下降,研究区陆棚砂体范围进一步扩大,浅水陆棚和深水陆棚向东南迁移,范围缩小。黑色页岩的有机质类型为Ⅲ型干酪根,有机碳含量很高,平均值为4.880%,普遍大于2%;有机质成熟度平均值为2.7%,总体演化程度较高; 黑色页岩的矿物成分主要为碎屑矿物和粘土矿物,碎屑矿物含量平均值为61.3%,成分主要为石英和少量的长石;粘土矿物含量平均值为31.1%,主要为伊利石和伊蒙混层矿物。与美国产气页岩的各项指标相比较,黔北地区下寒武统海相黑色页岩具有厚度较大、有机质丰度平均值高、热演化成熟度高、脆性矿物含量低、粘土矿物含量中等,页岩孔隙度低的特征。具备了页岩气形成的基本地质条件,是我国海相页岩气勘探的主要地区之一。综合评价预测了黔北地区下寒武统牛蹄塘组页岩气的有利、较有利远景区。

英文摘要：

Based on the test materials including the measurement of a large number of shales in the field geological section, the component analysis of the rock mineral samples and the result of organic geochemistry experiment, the characteristics of development and distribution about Lower Cambrian(Niutitang Formation)black shale in Upper Yangtze region (Qianbei area)has been systematically discussed. Besides, the prospective area of shale gas exploration in Qianbei area has been successfully predicted combining with the geological condition of marine shale formation in North America and the evaluation standard of prospective area of shale gas in China. The results show that the Lower Cambrian(Niutitang Formation)marine black shales in Qianbei area have the characteristics of large thickness and wide range of distribution. The water level was deeper in the early transgressive system tract(TST), the centre of deposition and settlement located in the southeast area, the main sources were supplied from the northwest area, and the sedimentary facies were sandy shelf facies, shallow water shelf facies and deep water shelf facies(distributed in the southeast part of study area and developed in the northwest-southeast direction). The water level got lower in the late highstand system tract(HST), the range of shelf sand bodies expanded with the descend of relative sea level, and the range of shallow water shelf and the deep water shelf narrowed down to the southeast part of study area. The organic material type of black shale is type III, and the average value of organic carbon content is high(4.88%), which generally greater than 2%; the overall evolution level is high with the higher average value of organic material maturity(2.7%); the mineral compositions of the black shale are the detrital mineral and the clay mineral. Black shale mainly composed of detrital minerals and clay minerals. The average content of detrital minerals is 61.3%, the ingredients are mainly quartz and a small quantity of feldspar; the average content of clay minerals is 31.1%, the ingredients are mainly illite and smectite mixed layer minerals. Compared to the indicators of the main shale gas production area in American, Lower Cambrian marine black shale in Qianbei area of Upper Yangtze region has a larger thickness, higher average abundance of organic matter, higher thermal evolution degree, lower brittleness mineral content, lower shale porosity and the characteristic of medium clay mineral content. This study area which has the basic geological conditions of producing shale gas is one of the main marine shale gas exploration areas in China. This paper makes comprehensive evaluatio

ns to predict the prospective areas and favorable areas of Lower Cambrian(Niutitang Formationg)black shale in Qianbei area.

关键词：黔北地区 下寒武统 海相页岩 页岩气 形成条件 远景区

投稿时间： 2012-12-18 最后修改时间： 2013-06-26