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中国小型断陷湖盆致密油地质特征及勘探潜力分析

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The Geological Characteristics and Exploration Potential of Tight Oil in Small Fault-subsided Lake Basins,China

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#### 摘要/Abstract

##### 摘要：

为了解中国小型断陷湖盆致密油资源潜力,以中国西北地区雅布赖盆地中侏罗统新河组下段为研究对象,依据大量地球化学、物性、薄片、电镜和能谱等资料,对盆地致密油地质特征进行了系统研究。研究结果表明:①新河组下段源岩沉积中心与沉降中心不重合,高丰度源岩( $TOC>1\%$ )主要分布在中部、东部次凹;成熟源岩分布在中部、西部次凹;②砂岩储层矿物成分主要为石英、长石、碳酸盐岩和黏土等,石英和长石含量较高,均值达60%;储层物性较差,孔隙度、渗透率一般小于10%和 $1\times 10^{-3}\mu\text{m}^2$ ,含油饱和度在10%~60%之间,最高可达70%;③含油致密储层,纵向上主要分布在中下部,平面上主要分布在小湖次凹;主要发育粒内孔、粒间孔、微裂缝和有机质孔等4种孔隙空间类型,前3种孔缝在各种矿物中较为常见,后者则较少见;④新河组下段油层压力系数较高、油质较轻,致密砂岩中油气以粒间孔中含油、溶蚀孔隙中含油、晶间孔中含油和微裂缝中含油4种方式赋存。雅布赖盆地新河组下段存在小湖次凹深洼带和盐场次凹斜坡带2个致密油勘探有利区,目前小湖次凹深洼带已获得工业油流突破,资源潜力较大,为下步勘探有利区带。

**关键词:** 小型断陷湖盆, 致密油, 地质特征, 勘探潜力

##### Abstract:

To understand resource potential of tight oil in small fault-subsided lake basins of China, this paper mainly takes the Lower Xinhe Formation of the Middle Jurassic in Northwest China as an example. According to the data of geochemistry, reservoir physical property, thin section, electron microscope scanning, energy spectrum, etc., this study systematically investigated geological characteristics of tight oil in the Lower Xinhe Formation of the basin. The result indicated that (1) Depocenter and subsidence center are not overlapped in the source rocks of the Lower Xinhe Formation. The high abundance of source rock ( $TOC>1\%$ ) in the Lower Xinhe Formation is mainly distributed in the middle and eastern sag of the basin. While, mature source rocks are mainly distributed in the middle and western sag of the basin. (2) The mineral composition of sandstones in the Lower Xinhe Formation are predominantly quartz, feldspar, carbonate rocks and clay minerals. Quartz and feldspar contents are relatively high, with an average of 60%. The reservoirs are dense and poriferous, permeability is generally less than 10% and  $1\times 10^{-3}\mu\text{m}^2$ , but oil saturation distribution is at 10%-60%. (3) The oil-bearing tight reservoirs are located in the middle and bottom of Lower Xinhe Formation, and the plane is mainly distributed in Xiaohuzi Sag. Four types of pores are presented in the tight sandstones of the Lower Xinhe Formation, such as interparticle pores, intraparticle pores, fracture pores and organic-matter pores. The first three are more common in minerals. (4) In the Lower Xinhe Formation, oil reservoir has high pressure coefficient, while the density of crude oil is not heavy. The oil and gas has four ways of occurrence manners in the tight reservoirs, such as interparticle pores, dissolved pores, intercrystalline pores and micro-fracture. The Yabulai Basin has two tight oil exploration targets, the slope of Yanchang Sag and deep depression zones of Xiaohuzi Sag. Industrial oil flow was obtained in deep depression zones of Xiaohuzi Sag, suggesting a great resource potential and favorable targets for future exploration.

**Key words:** Small fault-subsided lake basins, Tight oil, Geological characteristics, Exploration potential

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