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塔西南坳陷周缘原油地球化学特征与成因类型

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Geochemical characteristics and origin patterns of oils in periphery of southwestern Tarim Basin

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摘要

塔西南坳陷及其周缘是塔里木盆地重要的油气勘探战略接替区和新的储量增长点。伴随近年该区油气勘探活动中重要井位的突破,油气勘探显示十分明显的增长前景,成为重要的勘探和研究焦点。选取塔西南地区巴什托—亚松迪油气田、柯克亚油气田、喀什凹陷和玉北地区共32件原油和油砂进行原油族组成、原油气相色谱、色谱-质谱和碳同位素分析,厘定塔西南原油和油苗样品的典型地球化学特征,对原油进行精细划分并族群,揭示原油的成因类型。研究认为:塔西南麦盖提周缘地区识别出巴什托原油族群、柯克亚原油族群、克拉托原油族群和玉北原油族群。琼002井、琼003井、群5井、群7井等属巴什托原油族群,BT4井、曲1井和琼003井位于色力布亚断裂逆冲断裂带下盘,可能受深部寒武系等烃源层烃源贡献的影响,地球化学特征与巴什托主体原油显示差异性,但仍属于巴什托族群,BT2井分子地化特征与巴什托主体原油具明显差异,其位于色力布亚断裂带上盘,可能为寒武系烃源贡献。巴什托原油与LN46井和TZ30井所采集的典型台盆区奥陶系烃源岩具可比性,可能存在石炭系烃源岩的贡献,为混源油气藏;饱和气相色谱显示其为至少2期充注。柯东1井属柯克亚原油族群,油-源对比显示,柯克亚原油与侏罗系烃源岩具良好对比性。喀什凹陷原油与油砂存在差异,原油来自中下侏罗统康苏组和杨叶组烃源岩具可比性,克拉托油砂与下石炭统烃源岩可比。玉北地区的YB1井和YB1-2X井与巴什托原油族群地化特征具有可比性。丰富的油气显示与多套烃源层的复杂成因关系揭示塔西南地区油气勘探具有广阔的勘探前景。

关键词 : 原油族群, 油-源对比, 地球化学, 生物标志化合物, 塔西南坳陷

Abstract

Southwestern Tarim depression and its periphery are important strategic replacement regions of hydrocarbon exploration and new reserve growth points in Tarim Basin. Succeeding oil and gas breakthroughs in recent years have brought this region into the new spotlight of exploration frontiers. In this study, a total of 32 crude oil and oil sand samples were selected from Bashituo-Yasongdi oil and gas field, Kekeya oil and gas field, Kashi sag and Yubei area, southwestern Tarim Basin, which were used for crude oil group composition, gas chromatography, gas chromatography-mass spectrometer and carbon isotope analysis to determine typical geochemical characteristics of crude oil and oil seepage samples in southwestern Tarim Basin, precisely divide crude oil and groups as well as reveal the genetic types of crude oil. Research has indicated that Bashituo crude oil group, Kekeya crude oil group, Kelatuocrude oil group and Yubeicrude oil group are identified in the periphery of Makit slope of southwestern Tarim Basin. The Well Qiong 002, Qiong 003, Qun 5 and Qun 7 belong to Bashituo crude oil group. The Well BT4, Qu 1 and Qiong 003 are located at the footwall of Selibuya thrust fault belt, which may be influenced by the contributions of deep Cambrian source rocks, but still belong to Bashituo group though differences exist in geochemical characteristics compared with Bashituo crude oil. Located at the hanging wall of Selibuya fault belt, Well BT2 has significantly different molecular geochemical characteristics from Bashituo crude oil, which may be contributed from Cambrian source rocks. Bashituo crude oil has certain contrastive relations with typical Ordovician source rocks in craton area collected from Well LN46 and TZ30, which may be contributed from Carboniferous source rocks, and is classified as hybrid-source hydrocarbon reservoirs. Saturated hydrocarbon gas chromatography indicates that there are at least two stages of hydrocarbon charging. Well Kedong 1 belongs to Kekeyacrude oil group. Oil source correlation shows that Kekeya crude oil has a good contrastive correlation to Jurassic source rocks. Differences have been identified between crude oil and oil sands in Kashi sag, of which crude oil is sourced from Lower Jurassic source rocks in Kangsu Formation, and has a contrastive relation with source rocks in Yangye Formation. Moreover, oil sands have a comparative relation with Lower Carboniferous source rocks, while geochemical characteristics of the Well YB1 and YB1-2X in Yubei area have the same relation with those of Bashituo crude oil group. The complex genetic relation between abundant hydrocarbon and multi-set source beds shows a broad prospect in the hydrocarbon exploration of southwestern Tarim Basin.

Key words : crude oil group oil-source correlation geochemistry biomarkers southwestern Tarim Basin

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