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库车前陆盆地古近系岩盐对烃源岩生气高峰期的迟缓作用及其意义

卓勤功, 赵孟军, 李勇, 鲁雪松, 方世虎 ▾

The Delay of Paleogene Evaporate on the Gas Generation Peak of Source Rocks and Its Significance in Kuqa Foreland Basin

ZHUO Qin-gong , ZHAO Meng-jun , LI Yong , LU Xue-song , FANG Shi-hu

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摘要/Abstract

摘要 :

岩盐热导率是砂泥岩的2~3倍, 高热导率使盐下地层热量快速向上传递而降温、盐上地层热量快速增加而升温。库车前陆盆地三叠系—侏罗系烃源岩主要发育区被厚度超过1 500m的古近系—新近系膏盐岩覆盖, 中间相隔白垩系砂、泥岩。地层温度实测数据统计表明, 紧邻古近系膏盐岩的地层温度出现明显跳跃, 膏盐岩及盐上构造层的地温梯度大于盐下构造层白垩系的地温梯度。膏盐岩不发育的地区具有单一的地温梯度。深部烃源岩热演化史数值模拟表明, 随膏盐岩厚度增大, 盐下深层侏罗系烃源岩地层温度和热演化程度均降低, 1 500m膏盐岩可使侏罗系烃源岩地层温度和 R₀值分别降低15℃、0.35%;受岩盐的影响, 深部三叠系—侏罗系烃源岩生气高峰期延迟至库车中晚期—第四纪, 生气中心位于克拉苏构造带, 与晚期盐下大规模构造圈闭的有效期相匹配, 有利于盐下大气田的形成。烃源岩热演化史模拟结果与现今发现的天然气成熟度分布也十分吻合。

关键词: 岩盐, 热导率, 烃源岩, 热演化, 库车前陆盆地

Abstract:

The thermal conductivity of evaporites is two to four times greater than that of other sedimentary rocks.Strong heat conduction through evaporites can increase the geothermal gradient above the evaporities,and decrease the geothermal gradient below evaporites.Most Triassic-Jurassic hydrocarbon source rocks are overlain by over 1 500m thick Tertiary evaporites interlayered with Cretaceous sandstones and mudstones in the Kuqa Foreland Basin.Directly measured strata temperatures indicate an obvious jump in the the geothermal gradient near the Paleogene evaporates.The geothermal gradient above the evaporites is greater than those below the evaporites.There is a single geothermal gradient in the area without evaporates.Simulations of the thermal evolution of source rocks indicate that,with the increase of the thickness of halite and anhydrite,the strata temperatures and vitrinite reflectance in Jurassic source rocks will decrease accordingly.This indicates that the evaporites provide a preferred upward heat transport pathway.If the thickness of evaporites reaches 1 500m,the temperatures and vitrinite reflectance of Jurassic source rocks will decrease by 15℃ and 0.35% respectively.Evaporites delayed the gas generation peak of Jurassic-Triassic source rocks to the Middle-Late Kuqa Era-Quaternary Period.The gas generation center is located in the Kalasu tectonic belt.Therefore,the speculated natural gas generation time not only correlates with the formation period of the evaporite-related structural trap,but also coincides with the maturation of current exploited gas reserves,which is favorable for the formation of large gas fields under evaporites.

Key words: Evaporites, Thermal conductivity, Source rock, Thermal evolution, Kuqa Foreland Basin

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地址：甘肃省兰州市天水中路8号 (730000)

电话：(0931)8277790 Email: geogas@lzb.ac.cn

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