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塔河油田不同类型海相原油裂解动力学分析

马安来 ▾

Kinetics of Oil-cracking of Different Types of Marine Oils from Tahe Oilfield,Tarim Basin,NW China

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PDF (PC)

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摘要/Abstract

摘要：

应用黄金管热模拟方法研究了塔里木盆地塔河油田稠油、正常原油和高蜡原油3种不同类型海相原油热解过程的气态烃产率、碳同位素特征。塔里木盆地3种不同类型海相原油具有相似的生烃过程,随着热解温度的增高,甲烷产率不断增加,C₂—C₅产率呈现先增加后降低的趋势。在生烃量上,高蜡原油具有最高的总气态烃产率,为464mg/g油,而稠油具有最低的气态烃产率,为316mg/g油。在同位素演化过程中,δ¹³C₁值先变小后变大,δ¹³C₂值、δ¹³C₃值在温度大于420℃以后均呈现逐渐变大特征。使用Kinetics软件,计算了3种不同类型原油总气质量生成活化能。在频率因子为1.78×10¹⁴s⁻¹的前提下,3个原油气体质量产率的活化能分布较窄,范围为56~66kcal/mol。相比较而言,稠油总气体质量产率活化能分布范围最宽,主频活化能最低。使用原油动力学参数,根据油气藏破坏比例系数,计算塔里木盆地塔河原油作为油相保存的地质温度范围为178~206℃。塔中隆起中深1井中寒武统挥发性油藏的存在证实了上述结论。

关键词: 原油裂解, 动力学, 原油稳定性, 海相原油, 稠油, 正常原油, 高蜡原油, 塔里木盆地

Abstract:

The C₁-C₅ gas generation,carbon isotope ratios during cracking of heavy,normal and high-waxy marine oils from Tahe Oilfield,Tarim Basin,NW China,were described with closed-gold tube under high pressure.Three types of oil have similar gas-generation process,with C₁ yield increasing with pyrolytic temperature and C₂-C₅ yield increasing at first then decreasing with the temperature.Heavy-waxy oil has the highest C₁-C₅ yield of 510mg/g油,whereas heavy oil has the lowest C₁-C₅ yield of 316mg/g油.The δ¹³C₁ value was light at first,but gradually became heavier with the increase of pyrolytic temperature.However,the δ¹³C₂ and δ¹³C₃ values gradually became heavier when the temperature was greater than 420℃.Using kinetics software,the kinetic parameters of C₁-C₅ of different type of marine oils were calculated.With the frequency factor of about 1.78×10¹⁴s⁻¹,the distribution of the activation energy of C₁-C₅ mass formation was relatively narrow,with the range from 56 to 66kcal/mol.Among the three types of oil,heavy oil has the widest activation energy distribution,with the lowest major frequency of activation energy.Based on the kinetic parameters,in combination with the fractional conversion(C)of oil to gas,the maximum temperature at which oil can be preserved as a separate oil phase varies from about 178℃ at geological slow heating rates to 206℃ at geological fast heating rates.The existence of Middle Cambrian volatile reservoir of well Zhongshen 1 from Tazhong Uplift provided a strong evidence for the conclusion.

Key words: Oil-cracking, Kinetics, Oil stability, Marine oil, Heavy oil, Normal oil, High-waxy oil, Tarim Basin

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