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鄂尔多斯盆地中南部延长组7段页岩有机碳含量解释模型

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Interpretation model of organic carbon content of shale in Member 7 of Yanchang Formation, central-southern Ordos Basin

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摘要

鄂尔多斯盆地中南部延长组大多数井缺少自然伽马能谱、中子和密度等测井资料,如何利用自然伽马、声波时差和电阻率等常规测井资料提高页岩有机碳含量测井解释的精度显得尤为重要。通过分析鄂尔多斯盆地中南部延长组7段页岩有机碳含量及其常规测井响应特征,建立合适的有机碳含量解释模型,并根据解释结果分析页岩有机碳含量(TOC)、厚度(H)和(TOC×H)参数的平面分布特征。研究表明,有机碳含量与自然伽马、声波时差、电阻率和ΔLog$R$参数的相关性不明显,考虑不同井不同深度泥岩基线段对应的自然伽马值的相对变化,选取自然伽马相对值(ΔGR)代替自然伽马,并结合声波时差与有机碳含量进行多元线性回归分析建立相应的测井解释模型,其计算值与实测值吻合程度较高。该多元线性回归有机碳含量解释模型在鄂尔多斯盆地中南部延长组7段的应用效果较好,通过页岩有机碳含量、厚度及(TOC×H)参数的分布特征分析认为,该区富有机质页岩对页岩气储层具有较强的持续供气能力。

关键词 : ΔGR, 测井解释模型, 页岩有机碳含量, 延长组7段, 鄂尔多斯盆地

Abstract:

Most wells of Yanchang Formation, central-southern Ordos Basin are lack of natural gamma ray spectrology, neutron, density and other logging data. It is particularly important that how to improve the logging interpretation accuracy of organic carbon content of shale using gamma ray, acoustictime, resistivity and other conventional logging data. Then a suitable interpretation model of organic carbon content is established through analyzing the organic carbon content of shale in Member 7 of Yanchang Formation, central-southern Ordos Basin and conventional logging response characteristics, and interpretation results are applied to analyze the planar distribution characteristics of organic carbon content (TOC), thickness (H)and (TOC×H)parameters of shale. Studies have shown that organic carbon content has no significant correlation to gamma ray, acoustictime, resistivity and ΔLog$R$ parameters. In consideration of relative changes in the gamma ray value corresponding to mudstone base segment of different wells at different depths, the relative value of gamma ray(ΔGR)is selected to replace gamma ray, and in combination with acoustictime and organic carbon content, multi-linear regression analysis is conducted to establish the corresponding logging interpretation model. The calculated value has a high consistency with the measured value. The interpretation model of organic carbon content based on multi-linear regression has better application effect in Member 7 of Yanchang Formation, central-southern Ordos Basin. Through analysis of the distribution characteristics of TOC, H and (TOC×H)parameters of shale, it can be concluded that this region is rich in organic shale which has the strong capacity of continuous gas supply to shale gas reservoirs.

Key words: ΔGR logging interpretation model organic carbon content of shale Member 7 of Yanchang Formation Ordos Basin

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