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火山岩风化壳地层型油气藏评价预测方法研究——以新疆北部石炭系为例

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Evaluation and forecast methods of stratigraphic reservoir of volcanic weathering crust—an example from Carboniferous formation in northern Xinjiang

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摘要

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摘要 针对火山岩风化壳地层型油气藏非均质性, 评价预测难度大, 勘探成功率低等难题, 本文采用重磁电剥层处理、沿层延拓信号增强反演方法有效预测区域火山岩分布; 建立风化淋滤剥蚀后不同岩石组合的不完整火山机构和形态识别模式, 利用相干体和振幅分析等方法有效识别火山岩目标; 在建立单次火山喷发岩石序列及储层分布模式基础上, 开发了基于次生溶蚀孔隙和裂缝为主的波阻抗储层反演方法, 有效预测了多期次火山喷发间风化淋滤形成的叠置有利储层分布; 通过岩性、储层预测与振幅衰减属性、吸收系数差异预测结合, 有效预测含油气性。从火山岩区域预测到含油气性预测逐步逼近的火山岩风化壳地层型油气藏评价预测方法, 有效解决了火山岩风化壳地层型油气藏的评价预测难题, 指导发现了千亿方克拉美丽气田和亿吨级牛东油田, 利用该方法预测出下一步重点勘探的7个有利区带。

关键词: 火山岩风化壳 地层型油气藏 评价预测方法 新疆北部石炭系

Abstract: To cope with the strong heterogeneity of stratigraphic reservoir of volcanic weathering crust, and the consequent difficulty in prediction and low exploratory success ratio, the gravity-magnitude-electrical stripping and inversion of bedding continuation signal enhancing were used to predict the distribution of volcanic rock. The identification pattern of incomplete volcanic edifice with different lithofacies after weathering and leaching was established. Through coherency cube and amplitude analysis methods, volcanic targets were distinguished. Based on the lithologic sequence of a single volcanic eruption and the distribution pattern of reservoir, the reservoir inversion of wave impedance was developed which mainly focuses on the secondary dissolution porosity and fracture. With this inversion, the distribution of favorable superimposed reservoir formed by weathering and leaching during different volcanic eruptions was effectively predicted. Oil-gas bearing property was predicted by the combination of lithology, reservoir prediction, amplitude attenuation property and prediction of absorption coefficient difference. The problem of evaluation and prediction of stratigraphic reservoir of volcanic weathering crust has been solved in such an order: prediction of volcanic zone, oil-gas bearing property, and the reservoir. With the help of this method, Kelameili gas field, with hundreds of billion cubes of gas, and Niudong oilfield, with hundreds of million tons of oil, have been found. According to this method, 7 areas have been defined as the favorable zones in the next exploration.

Keywords: Volcanic weathering crust Stratigraphic reservoir Evaluation and prediction method Carboniferous formation in northern Xinjiang

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