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高含水致密砂岩气藏储层与水作用机理

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The Realization of the Active Mechanism between Formation and Water in Tight Sand Gas Reservoir with High Water Saturation

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124

摘要/Abstract

摘要 :

我国多数气藏均具有高含水饱和度特征,储层与水作用机理的认识是指导气藏科学开发的一项重要依据。建立了一套长岩心物理模拟实验方法,分类选择储层基质岩心分别在不同含水条件下,采用湿气开展了气藏衰竭开采物理模拟实验研究,得出了衰竭开采过程中不同渗透率储层实验前后含水饱和度变化特征,发现一项重要的开发机理认识,即不同渗透率砂岩储层与水的相互作用机理差异明显:①水在 I 类、II 类储层( $>0.5 \times 10^{-3} \mu\text{m}^2$ )内具有较好的流动性,在生产过程中岩心含水饱和度会下降,水会随气体一起产出,说明这类储层即使本身含水饱和度较高或者有外来水时,水也不会储层中过多滞留从而对气相渗流造成致命影响;②水在 III 类、IV 类储层( $<0.5 \times 10^{-3} \mu\text{m}^2$ )中渗流能力差,如果气藏没有足够大的能量,这类储层岩心的细微孔喉则会对原始孔隙水产生束缚作用,对外来侵入水产生捕集作用,从而导致储层含水饱和度升高,影响气相渗流能力。这一开发机理认识对于指导高含水致密砂岩气藏制订合理工作制度 and 开发对策具有一定意义。

**关键词:** 高含水, 致密砂岩气藏, 储层与水, 作用机理, 实验方法

Abstract:

High water saturation in tight sand gas formation is popular in China and the active mechanism between formation and water is very important for development. So we have built long core experimental method and equipment to research it, and cores used in the experiment have been classified into four types. The water saturations before and after experiment have been determined. Based on the result, we get a new and important realization of the active mechanism between formation and water in tight sand gas reservoir. For I and II formations ( $>0.5 \times 10^{-3} \mu\text{m}^2$ ), the water can flow freely, the water saturation declined when the experiment ends, and the gas and water have been produced well. But for the III and IV formations ( $<0.5 \times 10^{-3} \mu\text{m}^2$ ), the result is greatly different. It is difficult for water to flow in the formation and the water might be captured by thin pore and throat and then held by the formation, therefore, water saturation after experiment is higher than before. It will lead to the large decline of gas production, which is bad for gas development. It is one of the most important realization for development of tight sand gas reservoir with high water saturation.

**Key words:** High water saturation, Tight sand gas reservoir, Formation and water, The active mechanism, Experimental study

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