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水平井开采南海神狐海域天然气水合物数值模拟

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Numerical simulation of gas production from hydrate accumulations using a single horizontal well in Shenhu Area, South China Sea

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摘要 2007年5月,南海北部神狐海域的实地钻探结果表明该区域海底存在大量天然气水合物,其作为未来我国潜在的可开发能源的调查和资源评价工作正在展开.本文以SH7站位的钻探、测井数据为基础,建立了实际水合物藏分层地质模型,主要包括上盖层、水合物层和下盖层,其中上下盖层均为可渗透的沉积物.本文利用新型的开采井设计方式,进行了单一水平井定压降压法开采水合物的数值模拟.结果表明,开采过程中水合物分解区域主要集中在开采井周边区域、水合物层与上下盖层的界面附近区域.开采井产气量远小于存在不可渗透盖层的水合物藏,利用单一降压法不能经济有效地开采该区域天然气水合物.

关键词: 天然气水合物 降压开采 水平井 南海神狐海域

Abstract: In 2007, gas hydrate samples were recovered during the scientific expedition conducted by the China Geological Survey in the Shenhu Area. It is expected that Shenhu will become a strategic area of gas hydrate exploitation in China. However, evaluation of the hydrate deposits in the area as a potential energy resource has not been completed. Based on currently available data from site measurements, it is possible to develop preliminarily estimates of the gas production potential by numerical simulation. The hydrate accumulations in Shenhu Area are similar to Class 3 deposits (involving only a HBL), and the overburden and underburden layers are assumed to be permeable. In this study, we estimated gas production from hydrates in the Shenhu Area using the depressurization method with a single horizontal well. The simulation results indicated that the hydrate dissociation occurs on the cylindrical interface around the well, and along the horizontal dissociation interfaces at the top and bottom of the HBL. The gas production rate in the Class 3 hydrate deposit at site SH7 in Shenhu Area is not suitable for commercial production using the depressurization method.

Keywords: Natural gas hydrate Depressurization Horizontal well Shenhu Area South China Sea

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