鄂尔多斯盆地上古生界浅水砂体沉积模拟实验研究

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Experiments on Shallow-Lacustrine Deltaic Sandstone in the Ordos Basin(Upper Paleozoic),Central China

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摘要/Abstract

摘要：

鄂尔多斯盆地上古生界(山西组—下石盒子组盒8段)发育了大面积展布的浅水湖盆三角洲成因砂体，是当前天然气勘探的重点层系之一。针对当前气田勘探开发过程中存在的储集砂体成因机制不清及缺乏直观参照模型指导内部结构解剖的问题，调研目的层系区域构造演化、古地貌、沉积体系物源及沉积物构成等地质条件基础上，运用沉积物理模拟方法，将原型地质条件转化为物理模型并设计模拟实验参数，利用水槽物理模拟装置完成了模拟实验研究。研究设计了一个"多物源、浅水、敞流型"变态模型，通过控制水流量、加沙量、地形坡降、活动底板沉降量及湖水位升降等参数，再现了大面积浅水三角洲体系沉积演化过程，并采用双向密集切片技术开展沉积体系近源—中部—远源特征分析。实验结果表明：湖平面的升降及不同沉积物源间相互叠置是浅水湖盆三角洲大面积连片展布的主要因素，同时充足的沉积物供给及稳定合适的沉降速率也起到重要推动作用|浅水三角洲前缘并非类似于传统三角洲具有一个相对统一的前积区，而更可能是一个"同源不同期"朵叶体叠加的复合体。对模拟实验结果与地下真实砂体的可对比性也进行讨论，并指出了模型借鉴过程中可能存在的问题。

关键词: 变态模型, 物理模拟实验, 浅水三角洲砂体, 上古生界, 鄂尔多斯盆地

Abstract:

Interval from the Shanxi Formation to member 8 of Lower Shihezi Formation in the Upper Paleozoic,Ordos Basin,central China,is one of the most important exploration targeted strata,which develops large area of shallow lacustrine deltaic sandstone and bears giant natural gas source.This study investigates the reservoir sandstone development and trys to build a physical model to perform sandstone internal structure analysis in an experimental basin equipped with a subsiding floor.A distorted model characterized by multi-sources,shallow-water and open system,is established which is integrated with tectonic evolution,palaeo-geomorphology,sediment sources and related components and so on.Through the adjusting of experimental parameters,such as inflow water volume,sediment supply,gradient,subsidence value and fluctuation of lake-level etc.during each stage of the experiments,we can reproduce and investigate multi-source big area shallow-lacustrine deltaic deposition.And we use double-direction intensive cross sections to discuss different characters of shallow water deltaic deposits at the position of near-source,middle part and distal.The results indicate that lake-level fluctuation and interplay of multi-direction sources are main controls during the development of large area shallow-lacustrine deltaic deposits.Meanwhile,both abundant sediment supply and suitable subsidence ratio also play an important role in this process.Shallow lacustrine delta front is not similar to traditional deltas with relative uniform foresets,but has complicated internal architecture.Finally,we also compare the physical simulation results with the real subsurface sedimentary strata and point out potential problems.

Key words: Distorted model, Physical simulation experiments, Shallow-lacustrine deltaic sandstone, Upper Paleozoic, Ordos Basin

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