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渤南洼陷北带沙四上亚段储层低渗成因机制及分类评价

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Genetic Mechanisms and Classified Evaluation of Low Permeability Reservoirs of Es^s₄ in the North Zone of Bonan Sag

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摘要/Abstract

摘要 :

综合利用岩心观察、薄片鉴定、图像分析、压汞及岩石物性测试等多种技术方法,对渤南洼陷北带沙四上亚段储层进行了研究。研究表明,储层的成岩作用具有强烈压实、多期溶解、多期胶结和灰泥组分重结晶的特征。以“储层成岩作用演化序列—储层孔隙结构”为约束进行地质历史时期储层物性的恢复,确定不同亚相或微相、不同岩性储层的低渗形成时间,分析沙四上亚段砂砾岩低渗储层成因机制。分析发现,沙四上亚段砂砾岩储层存在5种不同成因类型的低渗储层:Ⅰ类储层为压实低渗特低渗、灰泥重结晶超低渗型;Ⅱ类储层为压实低渗、胶结特低超低渗型;Ⅲ类储层为压实低渗、特低渗型;Ⅳ类储层为溶蚀改善物性,压实胶结低渗型;Ⅴ类储层为压实低渗,压实胶结特低超低渗型。根据致密史—成藏史关系以及试油结果分析可知,Ⅳ类储层为高渗成藏—现今低渗型,勘探潜力最好,为好储层;Ⅲ类储层为中渗成藏—现今特低渗型,勘探潜力中等,为较好储层;Ⅴ类储层为低渗成藏—现今超低渗,勘探潜力较差,为中等储层;Ⅰ类和Ⅱ类储层分别为特低渗成藏—现今非渗型和中渗成藏—现今非渗型,勘探潜力小,为较差储层。

关键词: 低渗透储层, 成因机制, 致密史—成藏史, 沙四上亚段, 渤南洼陷

Abstract:

By means of core observation,thin section identification,image analysis,mercury penetration,petro-physical property testing and other technical methods,the low permeability reservoirs of Es^s₄were studied in the north zone of Bonan Sag.The diagenesis of low permeability reservoirs of Es^s₄ is characterized by strong compaction,multistage of dissolution and cementation,and lime-mud matrix recrystallization.Confined by conditions of “reservoir diagenesis evolutionary sequence and reservoir pore structure”,physical properties of the reservoirs in geological history were restored.The geological time when reservoirs of different lithology in different sub/micro-facies form low-permeability properties were determined based on the reservoir property evolutionary history.Genetic mechanisms of low permeability reservoirs of sandy conglomerate were investigated.There are five different genetic types of reservoirs.The characteristic of type I reservoir is that its low permeability and extra-low permeability are caused by compaction,while its ultra-low permeability is caused by lime-mud matrix recrystallization.The characteristic of type II reservoir is that its low permeability is caused by compaction,while its extra-low permeability and ultra-low permeability are caused by cementation;The characteristic of type III reservoir is that its low permeability and extra-low permeability are caused by compaction;The characteristic of type IV reservoir is that its physical property is improved by dissolution,while its low permeability is caused by compaction;The characteristic of type V reservoir is that its low permeability is caused by compaction,while its extra-low and ultra-low permeability are caused by compaction and cementation.According to a matching relationship between the reservoir compaction history and the hydrocarbon accumulation history as well as results from oil testing,type IV reservoir had high permeability in the hydrocarbon accumulation period and shows low permeability now,which is the best reservoir and has the best exploration potential;Type III reservoir had medium permeability in the hydrocarbon accumulation period and shows extra-low permeability now,which is better reservoir and has medium exploration potential;Type V reservoir had low permeability in the hydrocarbon accumulation period and shows ultra-low permeability now,which is medium reservoir and has poor exploration potential;Type I reservoir had extra low permeability while type II low permeability reservoir had medium permeability in the hydrocarbon accumulation period.Both of these two types of reservoirs show impermeability now,which are poor reservoirs and have little exploration potential.

Key words: Low permeability reservoir, Genetic mechanism, Compaction history-accumulation history;Es^s₄, Bonan Sag

中图分类号:

TE122.2+3

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