

徐伟,陈开远,曹正林,薛建勤,肖鹏,王文涛. 2014. 咸化湖盆混积岩成因机理研究. 岩石学报, 30(6): 1804-1816

咸化湖盆混积岩成因机理研究

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基金项目: 本文受中国石油天然气股份有限公司科学研究与技术开发重大专项项目(2012-ZG-003)资助。

摘要:

关于海相及淡水湖盆混积岩的研究已相对完善, 而针对咸化湖盆混积岩理论的形成及实际应用却鲜有报道, 本文旨在系统地阐述咸化湖盆混积岩的成因机理、沉积模式、分布规律, 对比其与一般混积岩沉积特征的异同点, 并探讨其与油气富集特征的相关性。本文采用矿物学、微观岩石学分析方法进行混积岩矿物组成、沉积特征、储集空间类型研究, 采取地质统计分析方法明确混积岩分布规律, 并运用物性分析方法对比不同类型混积岩的储集性能。结合柴达木盆地西北区新近系混积岩研究实例, 本文创新性地提出了欠补偿咸化湖盆的混积岩成因类型: 机械成因的相混合混积岩和生物成因的藻混合混积岩。相混合又可划分为两种亚类: 互层型混合、组构型混合; 藻混合亦可划分为两种亚类: 藻粘结混合、滑塌再混合。建立了咸化湖盆混积岩的沉积模式: 混积岩主要发育于三角洲、水下扇、滩坝等碎屑岩沉积体系与湖相碳酸盐岩沉积体系的过渡相带以及藻灰岩发育区。明确了混积岩的分布规律, 可归纳为“盆缘互层型、盆内组构型、藻混合局限分布”。混积岩沉积特征对比分析结果表明, 任何环境下混积岩形成的先决条件均为碳酸盐岩的生长和聚集, 而不同于淡水湖盆及海相混积岩沉积厚度大, 生物含量高等特点, 咸化湖盆混积岩单层厚度极薄, 并发育特殊的藻混积岩类。综合研究认为, 藻混合混积岩与油气储层的相关性要大于相混合混积岩。以上成果可为咸化湖盆混积岩, 乃至陆相湖泊混合沉积物的成因类型及油气地质意义研究提供借鉴与参考。

英文摘要:

Research on mixed sediments in marine and freshwater lake basins has been already relatively well-developed, but which on formation theory and practical application of the saline lacustrine mixed sediments was rarely reported. This paper aims to systematically expound the original mechanism, depositional model, distribution of saline lacustrine mixed sediments, compare the sedimentary characteristics with general mixed sediments and discuss the correlation with petroleum. This paper uses mineralogy, microscopic petrology analysis methods to study the mineral composition, sedimentary characteristics, reservoir space of the mixed sedimentary rocks, takes geostatistical analysis to explain distribution characteristics, and adopts the analysis of physical properties to compare the reservoir performance of different types of mixed sedimentary rocks. Combined with case studies on Neogene mixed sediments in the northwestern Qaidam Basin, this paper innovatively identifies two sedimentary processes that lead to the formation of mixed sediments in the under-compensated saline lacustrine basin: facies mixing and algae mixing. The facies mixing can be further divided into two subcategories: interstratified mixing and structural mixing. Likewise, the algae mixing can be further divided into two subcategories: algae bonding mixing and slumping remixing. It suggests a sedimentary model of the mixed deposits based on above-mentioned analysis of petrogenesis: the mixed sediments would be mainly found in the gradational lateral transition between delta, underwater fan, beach bar and lacustrine facies, also in the development area of algae. The distribution characteristics of the mixed sediments are further verified that the interstratified mixing mainly develop at the basin edge, while the structural mixing mainly distribute in the basin, and the algae mixing are scattered distribution, especially develop on the underwater uplift in the basin. Furthermore, the results of contrastive analysis on sedimentary characteristics show that the growth and accumulation of carbonate are prerequisite for the origin of mixed sediments in any sedimentary environment. What revealed further is that the mixed sediments in saline lacustrine basin are characterized by extremely thin layer and special algae mixing, while those in freshwater lake and marine environment have the features of thick layer and high content of biodebris. In addition, comprehensive research results indicate that the correlation with petroleum reservoir of algae mixing rock is better than facies mixing rock. In conclusion, current study provides valuable information for the research on both genetic type and correlation with petroleum reservoir of the saline lacustrine mixed sediments.

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