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Discovery of *Parachuaria* from the Chuanlinggou Formation of the Changcheng System in the Yanshan Region and Its Significance

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Parachuaria discovered from the Chuanlinggou Formation of the Changcheng System in the Yanshan region are clear in the outline and well preserved. A study on the *Parachuaria* fossils by means of HF acid-resistant maceration, fossil maceration and petrologic section methods indicates that Laminarites in the fossil bed may be remains and fragments of macro-algal *Parachuaria* fossils. Besides, there are a lot of *Leiominuscula* and *Trachysphaeridium minor* and other multicellular algae fragments. The carbonaceous macro-algal *Parachuaria* fossils may be ancient multicellular brown algae. *Parachuaria* is an important criterion of the evolution of primitive algae and is a representation of unique features and characteristics of bio-assemblage of the distinctive Precambrian stage of China. *Parachuaria* provides a basis for stratigraphic division and correlation of the Changcheng System as a result of the constancy of the fossil bed. The discovery of *Parachuaria* not only enriches the substance of the research of Precambrian bio-stratigraphy but also provides material for the research of the evolution of algae and its characteristics. Description of new species: Chuariaceae (Wenz), 1938 emed Duan, 1982, *Parachuaria* Zhu et Sun, 2002, *Parachuaria glabra* sp. nov. Description: fossils are discoid in outline, carbonaceous. Periphery smooth, diameter is generally 3–6 mm, minimum 0.5 mm, maximum 10 mm. Shield surface smooth, convex lens in cross section. Comparison: This species is like *Chuaria circularis* in shape, but, the individual is larger, periphery smooth, non-concentric ring. Occurrence: Chuanlinggou Formation of the Changcheng System in Jixian, Xinglong County.

Key words: *Parachuaria*, multicellular, Chuanlinggou Formation, Proterozoic

Deep-Sea Sediments Of the Guanyinqiao Member Of the Upper Ordovician Wufeng Formation in the Yangtze Area

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A comparison of sedimentation rate between the Guanyinqiao Member and modern deep-sea deposits, analysis of paleoecology, paleobiogeography and sea-level changes and study on its comprehensive geological characteristics demonstrate that the Guanyinqiao Member of the study area was formed in a deep-sea environment and should be deep-sea contourites. In addition, the authors suggest that highly frequent volcanic events across the Ordovician-Silurian boundary be the main and direct cause of organism extinction and that the coupling of volcanic events, iridium and carbon isotopic abnormality events and anoxic event

of the early Early Silurian at the turnover of the Ordovician-Silurian boundary may be the main cause of mass extinction of the *Hirnantia-Dalmanitina* fauna.

Key Words: Guanyinqiao Member, deep-sea sedimentation, organism extinction, geological event, Yangtze Area

The Kangxiwar Caledonian Khondalite Series in West Kunlun, China, and Its Geological Significance

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The Kangxiwar ductile strike-slip shear zone lies along the south of the West Kunlun terrane, a large nearly E-W-trending metamorphic terrane in the western Qinghai-Tibet Plateau. This ductile shear zone is composed of 7 km-wide mylonitized khondalites. The protoliths of the khondalites are aluminum-rich pelitic sediments with subordinate volcanic rocks and marble. The pelitic khondalites have pronounced positive Th anomalies and subdued positive Ce and Zr anomalies; the metavolcanic rocks have positive Nb and Zr anomalies. Both types of rocks in the khondalites are LREE enriched, and have weak HREE depletion and moderate Eu negative anomalies. *P-T* conditions for the formation of the khondalite series are estimated to be 6.8 GPa and 700°C, respectively. Zircon SHRIMP dating suggests that detrital zircons of khondalites were derived from old metamorphic basement older than 644 Ma. The khondalites formed in the Caledonian (428–445 Ma) and underwent strong shear deformation in the Indosinian (250–210 Ma). The Kangxiwar khondalites have similar features in the protoliths, trace element and rare earth element geochemistry, *P-T* conditions and age of formation to those of the South Altun khondalite series. This lateral correlation suggests that the West Kunlun terrane and the Altun terrane might have been the same terrane. The discovery of Caledonian khondalites in West Kunlun and Altun provides scientific evidence for the existence of mountain roots of the Caledonides, and suggests that the Altun fault system has experienced a sinistral displacement of 600 km.

Key words: Kangxiwar, Caledonian, khondalite

Geological Features and Tectonic Evolution in the Namjagbarwa Area, Eastern Himalayas

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The study area is located in the eastern Himalayan syntaxis. In the paper, firstly, the tectonic units are divided; secondly the geological features of each tectonic unit are introduced; finally the tectonic evolution and related questions are discussed, according

to the original data achieved by geological mapping and some conclusions drawn by other geologists. The following conclusions are reached: (1) The Namjagbarwa area can be divided into three first-order units: the Gandise-Lhasa block, the Yarlung Zangbo suture and the Indian block. The Yarlung Zangbo suture dominated by ophiolitic mélanges lies in a continued U type; the Indian block is formed individually by the Higher Himalayan crystalline rock series which is named the Namjagbarwa rock group. The Namjagbarwa group consists of the Zhibai Formation bearing high-pressure granulite lenses, Paixiang Formation and Duoxiongla migmatites. (2) The collision of the India plate with the Eurasian plate took place before 70 Ma. The movement of major faults has been dominated by detachment since 23 Ma; and large-scale migmatization and anatexis occurred at ca. 5 Ma. (3) The rise of the mantle is the key factor for the rapid uplift of the area, but the action of the river cannot be ignored either.

Key words: tectonic evolution, geological features, Eastern syntaxis, Himalayan orogen

Regional Differences between Basalts from the Middle and Southern Okinawa Trough and Their Genesis

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After contrasting the features in petrology and petrochemistry between the basalt samples from the middle and southern Okinawa Trough, we find that both of the basalts belong to the subalkalic series; the former vest in tholeiitic and calc-alkalic series, the latter mainly in calc-alkalic series. According to their petrochemical characteristics, the middle basalts are named quartz tholeiite primarily and the southern ones olivine tholeiite. The basaltic magmas of the middle and southern Okinawa Trough both originate from partial melting of the mantle rock underground, while the source mantle is inhomogeneous and the magma evolution degrees are different. The source of the middle samples is close to transitional mantle and the crystallization and differentiation have a higher degree; however, the southern ones sourced from depleted or enriched mantle, with weaker crystallization and differentiation. Basalts of the two areas have also experienced assimilation and contamination of different degrees. The differences in petrology and petrochemistry between the basalts from the middle and southern Okinawa Trough are directly related to their inhomogeneous source mantle and magma evolution at different degrees. The tectonic settings of the basalts are transitional between the MORB (tensile) and IAB (compressive), still representing the earlier stage of magmatic activities in the Okinawa Trough.

Key words: middle and southern Okinawa Trough, basalt, regional difference, genesis

Source of Fe-rich, High-Mg Magma in the Mazhartag Region, Xinjiang

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A group of Permian vein rocks intruding into the Silurian, Devonian, Carboniferous and Lower Permian occur on the western margin of the Tarim Plate in the Mazartag region in eastern Bachu County. The main rock types are diabases, diabase-prophyrites, chromocratic olivine gabbros and lamprophyres. The chromocratic olivine gabbros, with $\text{Fe}_2\text{O}_3 + \text{FeO} = 14.40\% - 16.88\%$, $\text{MgO} = 17.21\% - 18.59\%$, $\text{Mg}^\# = 67 - 68$, $\Sigma\text{FeO}/\text{MgO} < 1$ and $\text{Ni} = 469 \times 10^{-6} - 635 \times 10^{-6}$, belong to Fe-rich, high-Mg magma and are more or less representative of the primary magma, while the $\text{Mg}^\#$, $\Sigma\text{FeO}/\text{MgO}$ and Ni abundance of the diabases and diabase-prophyrites show they belong to moderately evolved magma. The petrography and petrochemistry show that fractional crystallization of the olivines and clinopyroxenes is the main mechanism of magmatic evolution. All vein rocks have the characteristics of rare earth elements and trace elements of basalts formed in the intra-late extensional settings. All rocks, with $^{143}\text{Nd}/^{144}\text{Nd} = 0.512508 - 0.512786$, $^{87}\text{Sr}/^{86}\text{Sr} = 0.704246 - 0.706444$, $^{206}\text{Pb}/^{204}\text{Pb} = 18.17 - 19.24$, $^{207}\text{Pb}/^{204}\text{Pb} = 15.47 - 15.71$ and $^{208}\text{Pb}/^{204}\text{Pb} = 38.63 - 39.32$, have identical Nd, Sr and Pb isotopic compositions. Therefore, it can be proved that these vein rocks have Nd, Sr and Pb isotopic compositions of primitive mantle and their magmatic source maybe lay in the lower mantle.

Key words: high-Mg magma, primitive mantle, Permian, Mazartag, Xinjiang

Cenozoic Volcanism and Mantle Plume along Southeast Coast of China

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The Cenozoic volcanic rocks in the southeastern coast areas of China becomes gradually younger from coast to inland areas (Niutoushan \rightarrow Minqing \rightarrow Mingxi), showing characteristics of volcanic chains. The characteristics of trace elements and Sr-Nd isotope are similar to those of OIB. The upper mantle shows a superthermal state and turbulent thermal structure. Geophysical study discovered a low- V_s anomaly and proposed a CT model. Volcanic rocks have relatively high $^3\text{He}/^4\text{He}$ ratios. These provide evidence for the existence of mantle plume beneath this area. On the basis of thermodynamic parameters, it is shown that, from coast to inland areas, the alkalinity of volcanic rocks and the formation depth of magmas increases and the degree of partial melting decreases as the age of volcanic rocks decreases. It is thus concluded that the formation of the mantle plume was induced by the subduction of the Pacific plate and that the mantle plume is above the subduction zone. Spreading of the South China Sea and formation of Cenozoic volcanic rocks are produced by mantle plume activity. A genesis model for the mantle plume is put forward in this study.

Key words: Cenozoic volcanism, mantle plume, volcanic chain, Pacific Ocean plate subduction

SHRIMP Dating of the Diorites and Granites in Southern Sunid Zuoqi, Inner Mongolia

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High-precision SHRIMP U-Pb zircon dating of the Sunid Zuoqi diorites and granites are reported. The analysis indicates that the Bayan Bold Na-rich granitoids were formed at 464 ± 8 Ma to 479 ± 8 Ma. The geochemical characteristics of the Bayan Bold Na-rich granitoids are similar to those of typical adakites, which may represent the subduction of the oceanic crust. It is suggested that the subduction event of the Inner Mongolia took place in the Early Ordovician. The Bayan Bold high-K granites whose geochemical characteristics are similar to those of the post-collisional high-K granites were formed at 423 ± 8 Ma to 424 ± 10 Ma. The results indicate that the collision event of the Inner Mongolia took place in the Early Silurian after the subduction event in the Early Ordovician. The formation of the Bao'erhan Lamasery high-K granites in the Late Triassic (220 Ma–204 Ma) was related to post-orogenic processes, most probably due to lithospheric delamination.

Key words: Sunid Zuoqi, Bayan Bold, Bao'erhan Lamasery, granites, SHRIMP dating

On the Existence of Neoproterozoic Materials in the Douling Complex, Eastern Qinling—Evidence from U-Pb SHRIMP and Sm-Nd Geochronology

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The Douling complex, which occurs at the boundary area between Henan and Shaanxi provinces, central China, is a tectonic block of restricted extent. Our study demonstrates that the complex formed in the period of 1.95–2.10 Ga ago due to structural amalgamation of several rock groups of different times and sources. The diopside leptynite present in the western part of the complex gives a T_{DM} age of 2.67–2.76 Ga and a detrital zircon SHRIMP age of 2.5–2.6 Ga, suggesting that the leptynite was derived from the Neoproterozoic source and that there was no or almost no hybridization of post-Archean continental materials. It also implies the presence of Neoproterozoic rock blocks nearby when the protolith of diopside leptynite was formed.

Key words: Douling complex, Neoproterozoic, materials

Sm-Nd Isotope Study on Metamorphosed Volcano-Sedimentary Rocks of the Jiaochagou Metamorphic Complex, Beishan Mt., Inner Mongolia

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Located in the northeastern part of the Kazakhstan-Beishan Plate

in Ejin Qi, Inner Mongolia, the Jiaochagou metamorphic complex consists mainly of migmatite, hornblende-plagioclase gneiss, K-feldspar-plagioclase gneiss, amphibolite, chlorite schist, quartzite and sericite-quartz schist. The tectonic setting of the metamorphic complex has been considered to be an uplift-related volcanic basin along the Precambrian continental margin. Sm-Nd isotope data of amphibolite and various gneiss samples are presented in this paper. Five amphibolite samples from the metamorphic complex give a Sm-Nd isochron age of 1264 ± 11 Ma with $\varepsilon_{Nd}(t)$ value of 7.24 ± 0.02 (2σ). As the Sm-Nd isochron age is in agreement with field geological evidence, it has been suggested to be the mafic volcanic eruption time of the Jiaochagou metamorphic complex. The original rock of the amphibolite was derived from a depleted mantle source. In contrast, the ε_{Nd} values (1264 Ma) of the gneiss samples range from 1.18 to -5.17 , which are much lower than those of amphibolite. Combined with other field and geological evidence, the authors believe that the contamination of magma by the continental crust was involved during the rock-forming process of the various gneiss of the Jiaochagou metamorphic complex.

Key words: Sm-Nd isotope, isochron age, metamorphic complex, Jiaochagou, Inner Mongolia

Source Compositions and Crustal contaminations of Adakitic Ore-bearing Porphyries in the Gangdise Copper Belt: Nd, Sr, Pb and O Isotope Constraints

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Based on isotopic data of 6 copper deposits of Jiamia, Lakang'e, Nanmu, Chongjiang, Tinggong and Dongga in the Gangdise copper belt, it is found that a good spatial variation regularity of Nd, Sr, Pb and O isotope compositions exists in the ore-bearing porphyries of the copper belt. Their Sr and Pb isotope compositions exhibit a radiogenic component increasing from the west to east along the belt. $^{87}\text{Sr}/^{86}\text{Sr}$, $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ have a range of 0.704635–0.707920, 18.315–18.661, 15.501–16.626 and 38.175–38.960, respectively. At the same time, Nd isotopic composition displays a gradual decrease of $^{143}\text{Nd}/^{144}\text{Nd}$ from the west to east (with a range of 0.512313 to 0.512931). A comprehensive study demonstrates that these ore-bearing porphyries were mainly derived from partial melting of the subducted Yarlung Zangbo oceanic crust under eclogite facies condition with a minor mixing of subducted sediments in the magma source. These isotopic variations are related to such a gradual increase in mixing sediments from the west to east along the copper belt. The approximately mixing ratios in different portions of the copper belt are <1% of the Dongga deposit from the west segment, 1%–5% of the Chongjiang, Tinggong, Nanmu and Lakang'e deposits from the middle segment and 10%–15% of the Jiamia deposit from the east segment. Unlike Nd, Sr and Pb isotopes, O isotope lacks the above regular variations. The $\delta^{18}\text{O}$ values of the ore-bearing porphyries are relatively stable along the whole copper belt (ranging from 5.5‰ to 9.8‰ with a mean of 7.7‰) and notably higher than that of depleted MORB (5.70‰). These variations indicate that the ore-bearing porphyries from the middle and west segments of the copper belt underwent more crustal contamination during their intrusion process in

consideration of their less source mixing of subducted sediments. A local sharp decrease of $\delta^{18}\text{O}$ values in the copper belt (Chongjiang and Tinggong deposits with a range of -1.8‰ to 0.5‰ and a mean of -0.5‰) is probably related to meteoric water metasomatism immediately after the porphyry consolidation and suggest a penetrating-down "funnel" present in this area.

Keywords: Gangdise copper belt, ore-bearing adakite, isotopes, source composition, crustal contamination

Characteristics of REE Minerals from Proterozoic Sedimentary Rocks of Northern China and Their Significance—Case Studies of Beijing and Dalian Areas

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The Precambrian Strata in Beijing and Dalian areas can represent Proterozoic sedimentary sequences of northern China. Since the discovery of authigenic monazite for the first time in the Shisanlitai Formation of Sinian System of Dalian area, we have discovered authigenic REE minerals of phosphate and silicate from the Changzhougou, Chuanlinggou and Dahongyu formations of Mesoproterozoic sedimentary rocks in Beijing area. There is a relationship between contents of REE in sedimentary rocks and presentation of authigenic REE minerals. According to the study of back scattered electron images and X-ray mapping of elements P, Th, La, Ce, Nd and Y by means of electron microscopic probe analysis, there are quite different properties between authigenic REE minerals and those from magmatic, metamorphic or associated heavy minerals of clastic sediments. This paper introduces for the first time the xenotime overgrowing on the clastic zircon grain margins in sedimentary rocks of the Changzhougou Formation, Changcheng System during the diagenesis process. Based on previous experiences there will be widely distributed authigenic REE minerals in Proterozoic sedimentary rocks of northern China, such as Jixian of Tianjin, western and southern Liaoning Province, and Xuanhua of Hebei Province. Those authigenic REE minerals can be used to determine their isotopic geological ages with the SHRIMP. Besides, in this paper we compared the similarity of crystalline forms and chemical compositions between the authigenic monazite of the Sinian System, Dalian area and the monazite in host rock slate of eastern iron mining area of Bayan Obo, Inner Mongolia. So we once more emphasize the suggestion that the Proterozoic K- and REE-enriched sedimentary rocks in northern China may be the source rocks for the huge REE ore deposits in Bayan Obo, Inner Mongolia.

Key words: authigenic REE minerals monazite xenotime Proterozoic sedimentary rocks

Geological and Geochemical Characteristics of the Hydrothermal Sediments in the Baguamiao Gold Deposit

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The genesis of the Baguamiao gold deposit is noticeable. The

author suggests that the banded rocks in the ore beds are of hydrothermal origin. This series of rocks occur along the strata, consisting mainly of interbeds of quartz-rich laminae, albite-quartz laminae and iron-rich carbonate laminae, which form a banded structure with sedimentary rhythms and sedimentary cycles. The banded rocks have gradually changed into phyllite or slate, which show characteristics of a hydrothermal sediment basin locally depressed. The chemical composition and microelement characteristics of the banded rocks are similar to those of siliceous, sodic and iron-carbonaceous hydrothermal sedimentary rocks in the Devonian lead-zinc deposits in the Qinling region. The hydrothermal sedimentary rocks are closely related to gold mineralization in space, which indicates that the Baguamiao gold deposit belongs to the hot water sedimentation (transformation) type. A correct understanding of the genetic type of the deposit is most helpful for ore prospecting in the region.

Key words: Baguamiao gold deposit, hydrothermal sedimentary rock, geochemistry, ore genesis, Qinling

Types, Characteristics and Metallogenic Geodynamic Evolution of Paleozoic Polymetallic Copper-Gold Deposits in the Western Tianshan Mountains

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Based on ore-bearing host rocks and mineralization patterns of copper-gold deposits in the western Tianshan Mountains, copper deposits can be classified into three types, i.e. porphyry copper deposits, skarn copper deposits and volcanogenic hydrothermal copper deposits. Gold deposits can be grouped into two types, i.e. epithermal gold deposits and porphyry gold deposits. There exist three E-W-trending mineralization zones in the western Tianshan Mountains: (1) the Alataw-Kokirgin copper polymetallic mineralization zone, which comprises porphyry-skarn copper deposits related to Mesoproterozoic limestone and Middle Hercynian hypabyssal intermediate-acidic intrusive rocks, porphyry copper deposits connected with Middle Hercynian hypabyssal acidic intrusive rocks, (2) the Boluokeluo gold polymetallic mineralization zone, which consists of epithermal gold deposits related to Lower Carboniferous intermediate-acidic pyroclastic rock and intermediate-basic lava, porphyry gold deposits connected with Middle Hercynian hypabyssal intermediate-acidic intrusive rocks, and (3) Awulale copper-silver polymetallic mineralization zone, which is composed of volcanogenic hydrothermal copper deposits related to Permian continental intermediate-basic volcanic rocks, porphyry copper deposits connected with Late Hercynian hypabyssal intermediate-acidic intrusive rocks. Based on a discussion on the Paleozoic geodynamic evolution in the western Tianshan Mountains, the three mineralization zones are corresponding with the Alataw-Kokirgin Late Paleozoic island arc zone, the Boluokeluo Late Paleozoic back-arc basin and the Awulale Permian rift zone respectively.

Key words: copper-gold deposits, ore deposit characteristics, metallogenic geodynamics, western Tianshan Mountains, Xinjiang

Petroleum Migration Features in the Kuqa Rejuvenated Foreland Basin, Northwestern China

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The paper presents firstly the features of hydrocarbon expulsion of the major source rocks in the Kuqa rejuvenated foreland basin, northwestern China. The results indicate that, while the Triassic mudstone is the main oil source rocks, the Jurassic coal and lake-swamp mudstone are the main gas source rocks, and the Keyi structure belt is the main source area of oil and gas. Moreover, the paper also presents the features of petroleum migration in the Kuqa Basin based on the study of the basin structure and gas distribution. There are such two types of petroleum migration routes, faults, unconformities and sandstone in the Kuqa basin. Unconformities and sandstone are the main lateral migration routes in which the oil and gas of the Qilitage structural belt and Northern Tarim Uplift migrated, and faults are the main vertical migration routes in which the oil and gas of the Keyi structural belt migrated. The migration time of oil and gas from different source rocks was different distinctively. The drive of migration was mainly abnormal pore fluid pressure. Finally, the vertical and lateral migration distances were also different, the former was about 2–5 km, and the latter was above 20–40 km.

Key words: Kuqa, rejuvenated foreland basin, petroleum migration, Keyi structural belt, Xinjiang

Characteristics and Genetic Mechanisms of Heavy Oils on the North Steep Slope of the Dongying Depression in the Bohai Bay Basin, East China

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Considerable heavy oils were discovered on the North Steep Slope (NSS) of the Dongying Depression in the Bohai Bay Basin. Oils from the NSS and adjacent Lijing Sag were collected for detail qualitative and quantitative investigation. It was observed that most of the oils from the NSS were subjected to biodegradation or water-washing, which result in saturated hydrocarbons and aromatics of the oils that are depleted in certain degree and absence of 25-norhopanes in most of the oils. It was observed that the oils with different degrees of deformation were mixed commonly in NSS based on composition and relative distribution of biomarkers, suggesting probably at least two main periods of oil charging in the area. The results also show that biomarkers quantification absolutely is useful for identifying the level of biodegradation and providing information of resistant ability of the biomarkers in the oils against microbial removal. According to detail geological and hydrological investigations combined with geochemistry, we suggest that chemically, biologically and physically such actions as biodegradation, water-washing and oxidation are the main genetic mechanisms resulting

in the formation of heavy oils, which make most light components of crude oil escaped while heavy components concentrated. It is concluded that special geological backgrounds such as weathering crust of burial hills on the NSS, high-porosity and high-permeability coarse sands and conglomerates of orderly distributed fan reservoirs, shallow buried oil pools, poor cap rock property and lateral plugging conditions, and development of complex faults and several unconformities are the most essential factors responsible for the formation of heavy oils on the NSS. Coexistence of heavy oils and relative normal oils on the NSS indicates that there is still a good prospect for the exploration of normal oils.

Key Words: heavy oil, biomarkers, biodegradation, North Steep Slope, fan,

Variation Characteristics of Sandstone Reservoirs When Sandstone and Mudstone Are Interbedded at Different Buried Depths

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Porosity and permeability of sandstone near the sandstone-mudstone boundary is affected by the stacking pattern of sandstone and mudstone. At shallow buried depths (<2500 m), the reservoir quality near the boundary is superior to the inner part of the reservoir. At deep buried depths, the stacking pattern, mudstone thickness, and the ratio of sandstone in the strata heavily affect the physical properties of the reservoir near the boundary. When mudstone is interbedded with sandstone and the sandstone is very thin with a low ratio, the sandstone has very poor physical properties, while its thickness increases to some extent (becoming medium thick). The physical properties are getting poorer from the interior of the sandstone to the sandstone-mudstone boundary. There exists a physical property transition zone whose thickness is 1/4–1/5 that of the sandstone. When mudstone at the top while sandstone at the bottom, or sandstone at the top while mudstone at the bottom, there is a physical transition zone only on the side of the contact with the mudstone. When sandstone and mudstone are alternated with almost the same thickness, the reservoir quality near the boundary is still inferior to the inner part of the reservoir, and with the decrease of the thickness and ratio of sandstone, quality of the sandstones is getting poorer. When the sandstone is interbedded with thin mudstone, physical properties of the reservoir around the boundary tend to be the same as that of the inner part of the reservoir, so the physical transition zone disappears. This phenomenon is closely connected with the diagenesis of mudstone. Fluids discharging from mudstone at shallow or medium depths are low in salinity and rich in organic acids. The dissolution near the boundary is more active than that in the inner part of the reservoir at shallow buried depths, whereas at deep buried depths, K^+ , Na^+ , Ca^{2+} , Mg^{2+} , Fe^{3+} , Si^{4+} and so on discharging from the mudstone are precipitated in most cases, so the cementation near the boundary is stronger than that in the interior, especially when the mudstone has greater thickness.

Key words: buried depth, stacking pattern of sandstone and mudstone, sandstone-mudstone boundary, physical properties of reservoirs, variation characteristics of physical properties, mechanism