Age determination of the "Black Zhifang Formation" (Triassic) in sourthern Ordos, North China through palynological biostratigraphy

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Abstract

The terrestrial Triassic strata, extremely developed in the Ordos Basin of North China, are important in oil and gas exploration. The Lower Triassic, divided into the Liujiagou Formation and Heshanggou Formation, is dominated by red sandstones and mudstones, which were formed in arid climates, the upper Middle Triassic to the Upper Triassic Yanchang Group chiefly comprise of gray-black shales interbedded with sandstones and mudstones formed under warm and humid conditions, are the major hydrocarbon source rocks of the Triassic system of the Ordos Basin. While, the Zhifang Formation, between the red beds and the black shales, is mainly composed of purplish red and grayish green sandstones and shales. Recently, a set of thousand meters thick gray sandstones interbedded with dark mudstones occurred at the Jinghe River Section in Chunhua county, southern Ordos Basin, have been assigned to the Zhifang Formation. It is called as the "Black Zhifang Formation" due to lack of purplish red beds and different from the normal Zhifang Formation. And accordingly, this "Black Zhifang Formation" is considered as a newly found hydrocarbon source rock bed underlain the major source rock bed of the Yanchang Group in the Ordos Basin.
Sporopollen analysis of the " Black Zhifang Formation" along the Jinghe River section, shows that the contents of spores in this formation are lower than that of pollen grains, and the occurrence frequency of the *Punctatisporites*, which is an important element in the Middle Triassic palynological assemblage (Zhifang Formation) is rather low, accounting for only 1% - 2%; while the late Triassic genera and species are common , such as *Limaturasporites*, *Asseretospora*, *Osmundacites*, *Aratrisporites*, *Chordasporites*, etc., *Leiotrilletes* and *Calamospora*. So, the palynological assemblage from the "Black Zhifang Formation" is not consistent with that of the normal Zhifang Formation in other sections of the Ordos Basin, but, it is closer to the palynological assemblage of the Yanchang Group. In addition, *Danaeopsis fecunda*, a species usually occurred in the Late Triassic Yanchang Flora, is also found in these beds. Therefore, the so called "Black Zhifang Formation" at the Jinghe River section is likely to belong to the Yanchang Group, and should be the Late Triassic in age .

Consquently, this "Black Zhifang Formation" should actually belong to the Yanchang Group, and therefore, there would be no more hydrocarbon source rock than that in the Yanchang Group. So, correct stratigraphic division, dating and correlation have important impacts on the oil and gas exploration.
The important oil shale bed of member 7 of theYanchang Formation=Chang 7was formed during the Ladinian of Middle Triassic, indicating a big environmental-climate change event,

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in the Ordos Basin of North China. This event is coeval with the main tectonic activity of the Qinling Orogenic and the large unconformity between the Middle Triassic and Upper Triassic in the Sichuan Basin of South China. It implys a major geological event in the Ladinian age of East Tethys, which caused the above tectonic orogenic movement and major changes in the environment.

Keywords: Palynological BiostratigraphyYanchang GroupLadinianthe Ordos Basin