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The study of detrital zircon geochronology, geochemistry and tectonic-sedimentary significance of Upper Triassic Yanchang Formation in central and western Ordos Basin

Ke Wu

Department of Geology, Northwest University, Xi'an, 710069, China (wuke_xbdx@163.com)

The Yanchang Formation of the Upper Triassic in the Jiyuan area in the central and western parts of the Ordos Basin is one of the main oil and gas enrichment areas in the basin. However, the tight sandstones of the Yanchang Formation have long been controversial on mineral genesis, formation age and sediment source. The distribution and variation characteristics of detrital zircon ages were studied using LA-ICP-MS dating and geochemistry testing of the detrital zircons from sandstones. The source of detrital zircons of different age components is identified, and difference of tectono-paleogeographic environments is analyzed. The main conclusions can be drawn as follows. Cathodoluminescence images show that most detrital zircon have a zonal structure. Rare Earth Element distribution models show that the sandstone is rich in HREE and is short of LREE, and all of models are left-dipping patterns. The Th/U values of detrital zircon show that most of the values are greater than 0.4, and a few are less than 0.1. The above geochemical testing results show that the source of detrital zircon is mainly magmatic rocks, followed by metamorphic rocks, and the ages of detrital zircons are reliable. The age results show that there exist three age stages of the Yanchang Formation detrital zircons, i.e., 228- 379 Ma, 1650- 1915 Ma, 2400- 2560 Ma, corresponding to the tectonic movements of Indosinian, Hercynian, middle- late Lüliang movement and early- middle Wutai movement. By comparing the isotopic ages for the plutons in and around research areas, the tight sandstone of the Yanchang Formation in the central and western parts of the Ordos Basin derive from the Daqing Mountains-Wula Mountains, Yinshan Mountains and Jining areas in the north-northeast of the Ordos Basin. The sedimentary rocks source from gneissic granite in the late Neoproterozoic, ancient TTG gneiss and granulite in the early Paleoproterozoic, the khondalite belt in the Lüliang Movement, and the magmatic rock in the Indosinian and Hercynian.