

The Genetic Mechanism of Lower Cretaceous Red Beds in North Yellow Sea Basin

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Abstract

Lower Cretaceous lacustrine red beds in North Yellow Sea Basin belong underwater deposits, which comes into being a contradiction with traditional sedimentary theory that the red mudstone is related to exposure deposition. According to the description of petrological, mineralogical and geochemical (stable carbon and oxygen isotope test, main elements test and trace elements test in 13 red beds and black mudstone samples) characteristics, together with geological analysis and igneous rock testing data, we found that the red deposits was closely related to igneous activity. Concrete evidences followed can prove this assumption: (1) Granite debris, falling volcanic debris and volcanic burst-crystal can be seen under microscope in Lower Cretaceous sandstone samples. This indicates that there is a mixed provenance of terrigenous clastics and volcanic rocks. (2) Coring section of sandstone from 2413-2417.12 meters in well C is characterized by expansion, texture osteoporosis, frangibility and crystallization. This may be due to the thermal influence of magma intrusion, and the high-melting-point mineral will crystallize when cooling. (3) Test data shows that average ferric oxide, total iron content in Lower Cretaceous black mudstone is 2.35% and 4.45%, respectively. While in red beds is 5.66% and 6.98%, which display abnormally high; Meanwhile, major elements analysis show that the red mudstone belong to hydrothermal origin and $w(\text{REE}) - w(\text{La}) / w(\text{Yb})$ graphic indicates that Lower Cretaceous mudstone are not normal lacustrine sediments. They are affected seriously by basalt; at the same time, trace elements in mudstone which are closely related to hydrothermal activity such as Sr, Ba, Zn have higher content than average; All above suggest hydrothermal fluid influenced the deposition and offered additional ions for red beds. (4) Igneous rock dating results reveal that there are four stages of regional magmatism. Moreover, most of the tested samples belong stage 108 ~ 115Ma and stage 134 ~ 145Ma which corresponding to the early Cretaceous. Although the drilled igneous rock mostly belong to instructive facies in Lowe Cretaceous, but we can speculate that under so frequently igneous activities in the Early Cretaceous settings, there should have corresponding extrusive facies deposition of basalt. The gushed out ferric ions accompanied by hydrothermal fluid are main colouring ions, which offered for red beds and finally led to the red deposition.