SEQUENCE STRATIGRAPHY AND SEDIMENTARY ENVIRONMENT OF THE EOCENE HUADIAN FORMATION IN THE HUADIAN BASIN (NE CHINA): IMPLICATIONS FOR OIL SHALE DISTRIBUTION

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Recceived 12 January 2016

The Huadian basin is a small, explored, coal and oil shale-bearing, Cenozoic fault basin in the middle part of the Fushun-Mishan Fault Zone, northeastern China. The basin primarily consists of the Eocene Huadian Formation and contains abundant oil shale resources. This basin is also one of the bases of underground oil shale mining at present. Based on core inspection and description from five wells and the analyses of hundreds of samples using various approaches, namely, thin section study, pollen identification and geochemical analyses (TOC, oil yield, trace elements (B, Mo, Sr/Ba, B/Ga, Sr/Cu, V/V+Ni and Ni/Co)), the sequence stratigraphy of the Eocene Huadian Formation has been established, and the sedimentary environment has been studied in this paper. Four third-order sequences and three types of sedimentary facies, including fan delta, lacustrine and subaqueous fan, are identified in the Huadian Formation. During the Eocene period, the basin experienced three sedimentary evolution stages: the initial subsidence stage mainly developed shore-shallow lake and fan delta sediments, the maximum subsidence stage is dominated by semi-deep and deep lake sediments, and the rapid downwarp filling stage mainly developed fan delta, limnetic and shore-shallow lake sediments. Oil shale mainly developed in the transgressive system tract (TST) and highstand system tract (HST) of sequence III (Oil shale member of semi-deep and deep lake facies). The TST developed the 7^{th} to 13^{th} layers of oil shale, characterized by thin beds, low to medium oil yield and, low to medium organic matter enrichment. The HST developed the 2^{nd} to 6^{th} layers of oil shale, characterized by widely distributed, thick beds, high oil yield and medium to high organic matter enrichment. In one parasequence, oil shale mainly developed in the lake flood period. High initial lake productivity and stable underlying water oxygen levels (lower decomposition rate) influenced by climate form the most favorable environment for oil shale formation.

Key words: **Huadian Basin; Sequence stratigraphy; Sedimentary environment; Eocene; Oil shale.**