

18.06

### **Recovery of oil shale forming environment in Songliao Basin**

Guo Wej, Ma Lin

*Jilin University, Changchun, China*

Despite the significant oil shale resources in Songliao Basin, there have been few substantial studies on the mechanism of oil shale formation for this deposit. Oil shale formation is generally controlled by the paleoenvironment and so in this study we have reconstructed the environment of the Songliao Basin during oil shale formation utilizing data derived from geochemical assessment of core samples as well as analysis of pollen and trace elements. The lake transgressions during the periods of the Qingshankou and Nenjiang Formation formed a large shore-shallow lake, with semi-deep and deep lake sediments. Based on the analysis of 42 cores, oil shale developed in semi-deep and deep lake facies, and the sedimentary environment controlled the distribution of oil shale. Pine pollen is a significant component of the pollen assemblage during the Qingshankou Formation, while the contribution from classopollis and cycas pollen is low and the thermophilic fern spores are dominant. All of these factors indicate a subhumid climate during the formation of the Qingshankou oil shale. In the pollen assemblage of Ningjiang Formation, thermophilous and sporo-pollen hygrophilous are dominant, which indicates that the climate was warm and humid. The trace metal analysis, specifically the Sr/Ba ratio, can be used to assess water salinity and climate conditions during the formation of sedimentary rock. The Sr/Ba ratios of oil shale in Songliao Basin are between 0.6 and 0.9, indicating brackish conditions existed in the ancient lake. Other trace metal ratios can be used to assess redox conditions, specifically Ni/Co, Ni/V and V/(V + Ni). Ni/Co ratios of Songliao Basin oil shale are always greater than one and Ni/V ratios are always less than 0.5, indicating a reductive environment during their formation. V/(V+Ni) ratios are greater than 0.54, which show the environment was anaerobic. In summary, oil shale in Songliao Basin formed in a semi deep to deep brackish lake, under warm and humid to semi-humid climate conditions.