The new understanding of the siliceous source and depositional environment in Xiamaling Formation (1.38 Ga), North of China

HUAJIAN WANG[1], XIAOMEI WANG[1] AND SHUICHANG ZHANG[1]*

[1]Research Institute of Petroleum Exploration & Development, CNPC, Beijing 100083, China (wanghuajian@petrochina.com.cn, wxm01@petrochina.com.cn, *correspondence: sczhang@petrochina.com.cn)

Organic-rich and silicic-rich marine sediments were deposited during Xiamaling Formation (XML, ~1.38 Ga) in Xiahuayuan, northern China. Irrespective of the cherts, the contents of SiO_2 in the black shales were generally up to 50%. Though XML profile was considered as one of the representative Mesoproterozoic stratum in China, many key issues such as the precursors of organic matters, the siliceous sources and paleo-environment have long been controversial.

Elemental analysis of a large number samples showed that, the contents of Ti and Al, which can be characterized as terrestrial input, were relatively high in cherts and black shale, while Fe and Mn that were related to hydrothermal activity were relatively low. The average ratio of Fe/Ti in chert was 16.0, lower than the limit value of hydrothermal chert (>20). The average ratio of Al/(Al+Fe+Mn) was 0.6, closed to the average value of world shale (~0.62), higher than the limit value of hydrothermal chert (<0.35). In addition, after normalized with chondrite, the distribution pattern of REE of the chert showed great similarities with the continental crust. The average ratio of MnO/TiO_2 (~0.06) and LREE/HREE (~2.14) in chert indicated a shallow continental shelf environment.

Higher contents of terrigenous materials means serious weathering, further implying abundant elements nutrients and high contents of carbon dioxide in such environment. The lower V/(V+Ni) ratio (~0.64) and δU value (~0.87), together with the slight negative δCe (~0.82), further indicated a shallow and weakly oxidized environment during the chert deposition. These evidences proved that the siliceous source in XML Formation should be terrigenous, rather than the originally understanding of hydrothermal source[1,2]. Both of these conditions were conducive to biological thrive, which provided plentiful initial organic sources during the XML Formation in Xiahuayuan.

[1] Zhang, *et al* (2007) *Sci China Ser D* **50**, 527-535. [2] Wang, *et al* (2006) *Chinese Sci Bull* **51**, 585-593.