The Crustal Carbon Cycling in the Late Cretaceous Extension of Bangong Lake Arc Zone in the Xizang (Tibetan) Plateau

SONG Yang[1)], QU Xiaoming[1)], XIN Hongbo[1)], WANG Zhiyun[2)], DU Dedao[3)]

1) *MLR Key Laboratory of Metallogeny and Mineral Assessment*, *Institute of Mineral Resources*, *Chinese Academy of Geological Sciences*, *Beijing*, 100037;

2) *Science Research Institute*, *China University of Geosciences*, *Beijing*, 100083;

3) *School of Earth Sciences and Resources*, *China University of Geosciences*, *Beijing*, 100083

Abatract: Magnesian carbonatite rocks in the Bangong Lake area are due to the crustal carbon cycling under the influence of magma and fluids in the process of Qinghai—Tibet plateau uplift. LA-MC-ICP-MS U-Pb isotope dating of metasomatic zircons from the magnesian carbonatites shows that the weighted average age is 80.3 ± 1.2Ma (*MSWD* = 3.8). The results explain that metasomatic magnesian carbonatite was formed in Late Cretaceous, and was related to the activities of contemporary acid rock wall in this area. C and O isotope determinations of magnesite and siderite show $\delta^{13}C_{V\text{-}PDB}$ values ranges from 0.9‰ to 1.6‰, averagely 1.25‰, and $\delta^{18}O_{V\text{-}SMOW}$ values ranges from 15.9‰ to 21.7‰, averagely 18.65‰, indicatings that the carbon was derived from the marine carbonate rocks in the surrounding rock. The carbon cycle conditions reveal that a lot of fluid as the carrier came from meteoric water, and circulating temperature was evaluated between 300 ~ 350℃ from the 100 m to 2.1km underground. The slack tectonic setting in late Cretaceous contribute to magma upwelling and infiltration of meteoric water. More importantly, it provides an available driver to speed up the emissions of CO_2, and carbon circulation in the crust.

Key words: carbon circulation; magnesian carbonatite; LA-MC-ICP-MS; isotope; Xizang (Tibetan) plateau; Bangong Lake

库车盆地古近系蒸发岩中钾盐矿物研究进展

刘成林,焦鹏程,宣之强,曹养同,赵宪福

中国地质科学院矿产资源研究所国土资源部成矿作用与资源评价重点实验室,北京,100037

库车盆地位于新疆塔里木板块北缘,总面积约为3万 km^2,是一个再生前陆盆地,古近纪属于海相-海陆过渡相沉积,蒸发岩沉积广泛,厚度巨大。笔者自2002年以来,一直在库车盆地开展成钾条件研究,详细考察了众多蒸发岩出露点,并对出露点系统采样,采集石油钻井岩屑,实施了钾盐科探井。对所采众多岩石样品进行分析测试,发现多个采样点具有含钾矿物分布。根据能谱化学组成与XRD等分析,推测有光卤石、钾石膏,钾芒硝、杂卤石、钾镁矾、钾石盐等。其中KL4井岩盐(岩屑)中的钾石盐特征明显,具有重要找钾指示意义。

1 钾石盐矿物特征

(1)星点状分布的钾石盐:由图1a可见,灰色晶体为石盐;白色者为钾石盐,呈立方体、长方体及他它形,多为单晶体产出,晶体大小10~30 μm,呈星点状分布于石盐晶体之间。化学组成见图1b中钾石盐能谱图。

(2)条带状分布的钾石盐:灰色为石盐,白色为钾石盐。钾石盐单晶多为立方体和长方体,大小一般20~50 μm,集合体呈带状或串珠状分布;部分条带受到压溶作用,而发生弯曲及港湾状溶蚀(图1c)。化学组成见图1d中钾石盐能谱图。

(3)脉状—港湾状钾石盐:白色为钾石盐,单晶体不明显,以集合体形式产出,形态为脉状及港湾状,大小为100 μm×200~300 μm(图1e)。化学组成见图1f。

2 钾石盐成因初析

目前,所发现的钾石盐均分布于库姆格列木群,属于古近系蒸发岩的中盐组,时代相当于始新世中晚期。根据露头调查与钻探揭露,库车盆地古近系蒸发岩矿物主要是石盐,其次为石膏,矿物组合很简单,目前,仅在岩盐中发现微量钾

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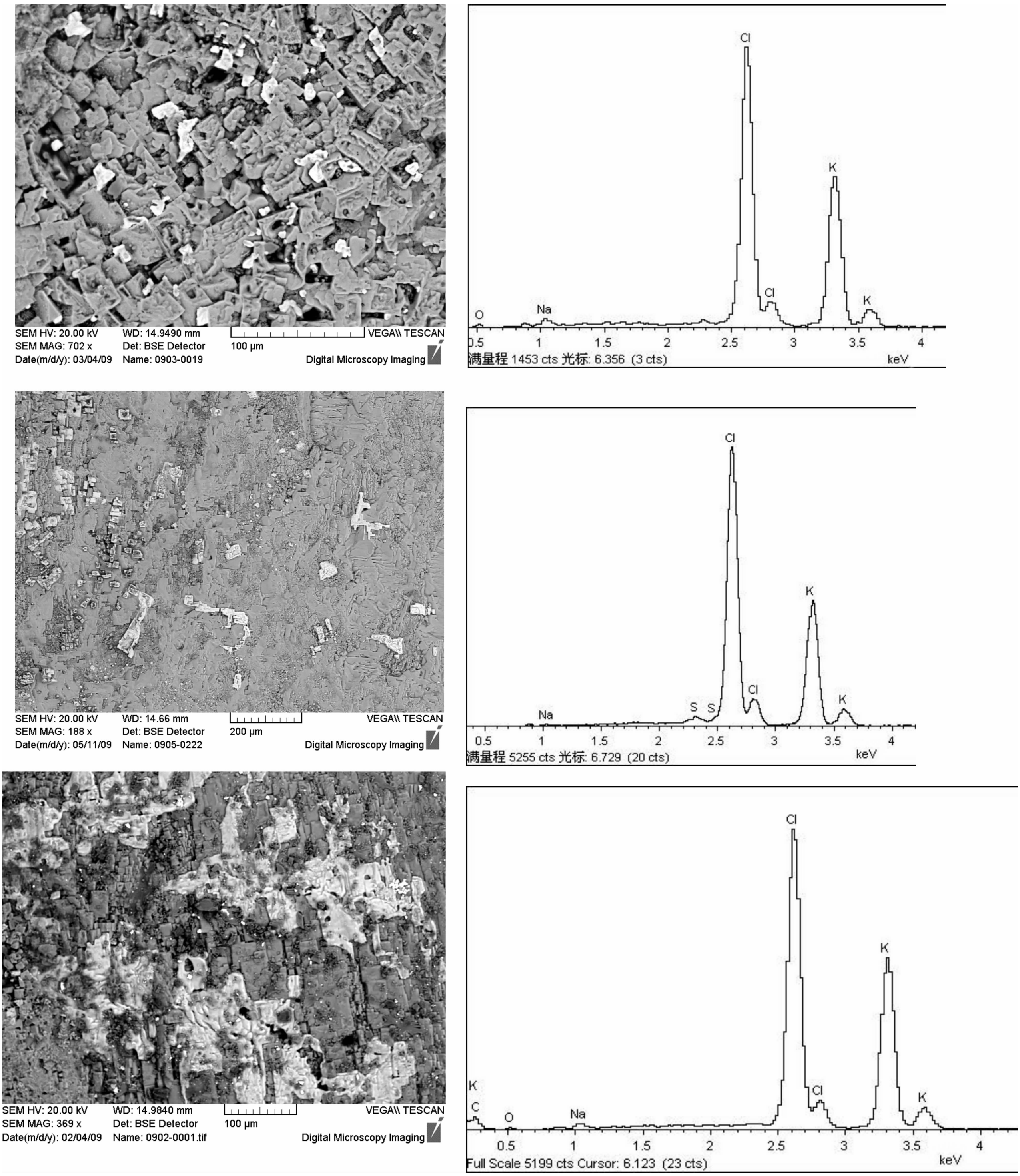

图 1 库车盆地古近系蒸发岩电子探针照片及钾石盐能谱图(样品均为岩屑)

(a)、(b) 样品号 $KL_4$2533,灰色立方体石盐中白色钾石盐(a)及钾石盐能谱图(b);(c)、(d) 样品号 $KL_4$2474,岩盐中的白色氯化钾矿物(c)及氯化钾能谱图(d);(e)、(f) 样品号 $KL_4$2471,白色脉状—港湾状钾石盐(e)及钾石盐能谱图(f)

石盐等含钾矿物。如果从海水蒸发析盐演化序列分析,库车盆地古近纪盐湖只浓缩到石盐析出阶段,但从钾石盐产状分析,它们是从石盐晶间卤水中析出的,并且受到一定成岩作用影响,发生一定变形或港湾状溶蚀,这种产状特征与云南思茅盆地勐野井钾矿岩盐中钾石盐的产状特征相似。因此,上述三种产状的钾石盐均应属于古盐湖晚期卤水析出的产物,即属于原生沉积。

鉴于库车盆地已出现了巨量石盐沉积,析盐后古盐湖已积累了大量的富钾卤水,并在始新世时期达到析钾临界点。如果此时期,构造运动形成有利的“次级深凹”,富钾卤水就会因重力作用而迁移至这些新生的深凹中,继续蒸发即可以出现钾盐沉积。