Kinetic modelling of gas generation and methane carbon isotope fractionation during the cracking of aromatic hydrocarbons

H. TIAN[1]*, X.M. XIAO[1], L.G. GUO[1] AND Y.F. ZHU[2]

[1]State Key Laboratory of Organic Geochemistry, Guangzhou Institute of Geochemistry, CAS, Guangzhou 510640, China (*correspondence: tianhui@gig.ac.cn)
[2]Tarim Oil Field Company, Korla 841000, China

The experimental pyrolysis of crude oil in a closed system produces gases characterized by abundance of wet gases and large methane carbon isotope fractionation [1, 2]. Crude oil, however, is a mixture of various compounds whose thermal and geochemical vary significantly [3]. The kinetic model of gas generation and methane carbon isotope fractionation based on the pyrolytic data of aromatics with an initial carbon isotope of -28.34‰ illustrates that the cracking of aromatics could produce drier gases with dryness index more than 60% and heavier methane carbon isotopes ranging from -41.1‰ to -30.9‰, which is quite different from the gases derived from the cracking of crude oil or saturates [1, 2]. The results further indicate that a compositional kinetic model of oil cracking, including both gas generation and carbon isotope fractionation, is very essential to understand the oil cracking in some high maturity basins.

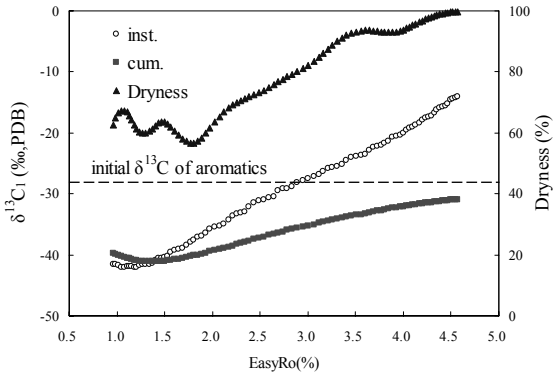

Figure 1: The evolution of dryness and methane carbon isotope of gases from the cracking of aromatic hydrocarbons at a geological heating rate of 2°C/Ma.

Supported by NSFC(Grant No. 40802025 and 40625011).

[1] Tang *et al*. (2000) *GCA* **64**, 2673–2687. [2] Hill *et al*. (2003) *Org. Geochem*. **34**, 1651-1672. [3] Behar *et al*. (2008) *Org. Geochem*. **39**, 764-782.

Recycling/assimilation of the ultramafic lower crust in arc settings: Evidence from southern Adamello (Italian Alps)

M. TIEPOLO[1], R. TRIBUZIO[1,2] AND A. LANGONE[1]

[1]C.N.R. – Istituto di Geoscienze e Georisorse, U.O. Pavia, Pavia, Italy
[2]Dipartimento di Scienze della Terra, Università di Pavia, Pavia, Italy

In the amphibole-rich mafic and ultramafic intrusives of the Re di Castello Unit (southern Adamello), olivine-rich (+ clinopyroxene + spinel) clusters have been found. Olivine (Fo up to 85 mol%) show triple junctions and clinopyroxene (mg# up to 0.9) is locally included into olivine. These clusters represent fragments of an older ultramafic rock (possibly a wehrlite) that was dismembered by the injection of the hydrous magma that gave rise to the host amph-rich gabbroic rocks. Trace element compositon of clinopyroxene included into olivine indicates that these early intrusive bodies were crystallised from a high-Mg andesite enriched in LREE, Th, U and strongly depleted in HREE.

The process of recycling/assimilation is confirmed by the in situ U-Pb zircon geocronology. Zircons were separated from mafic and ultramafic amph-rich rocks and were charaterised for the internal structure by cathodoluminescence. The occurrence of inherithed cores texturally distinct from the rims has been found. The age determinations with excimer laser ablation ICPMS on the outermost rims with oscillatory zoning and quartz inclusions confirm the literature age of 40 Ma [1]. Inherited cores with igneous trace element composition yield significantly older Alpine ages.

Implications of this work are twofold. Data provide evidence for a magmatic activity, most likely subduction related, older than 40 Ma. The evidence of assimilation of the ultramafic roots of island arc by later hydrous melts has also implications for the genesis of the continental crust being an alternative or complementary way to subtract the ultramafic component.

[1] Hansmann & Oberli (1991) *Contrib. Mineral. Petrol*. **107**, 501–518.