Extreme U-Th-Pb fractionation among hydrogenic fracture-coating minerals in felsic tuffs at Yucca Mountain, Nevada, USA: Implications for geochronology

L.A. NEYMARK[1] AND Y. AMELIN[2]

[1]S.M. Stoller Corp., c/o U.S. Geological Survey, Denver Federal Center, Box 25046, MS 963, Denver, CO 80225, USA (lneymark@usgs.gov)

[2]Royal Ontario Museum, 100 Queen's Park, Toronto, ON M5S 2C6, Canada (yuria@rom.on.ca)

Extreme fractionation of U, Th, and Pb among the fracture-coating calcite, silica, fluorite, and Mn oxides from hydrologically unsaturated Miocene-age welded tuffs at Yucca Mountain, Nevada, is the basis for the use of U-series and U-Pb dating methods to establish the paleohydrologic history of the site

Concentrations of U, Th, and Pb in hydrogenic fracture-coating minerals vary by 6-7 orders of magnitude (Figure).

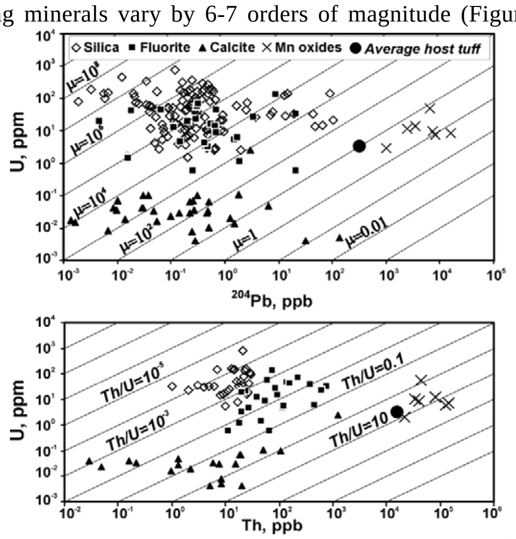

Figure: Concentrations of U (ppm), Th(ppb), and ^{204}Pb(ppb) in hydrogenic fracture-coating minerals and an average host tuff at Yucca Mountain.

Calcite is depleted in all three elements relative to the host tuffs, whereas other minerals are commonly enriched in U. Concentrations of Th and common Pb are high in Mn-oxides and low in most silica and fluorite samples, which indicates that Mn oxides may behave as sinks for Th and Pb carried by water percolating down through the fracture. Silica, calcite, and fluorite, which are typically younger than Mn oxides, have elevated U/Th and $^{238}U/^{204}Pb$ (μ) ratios and are suitable minerals for U-series and U-Pb dating. Previous studies have shown that Yucca Mountain opal and calcite can be dated successfully by the U-series techniques. The initial excess of intermediate decay products of ^{238}U complicates the application of U-Pb geochronology to low-U calcite. $^{206}Pb/^{238}U$ dating of silica is complicated by initial excess of ^{234}U, inherited from fracture water, but $^{207}Pb/^{235}U$ ages are reliable and consistent with the microstratigraphy of the coatings. Preliminary data indicate that the U-Pb method can be used to date high-μ fluorite at Yucca Mountain.

A possible magmatic origin of Bayan Obo Fe-Nb-REE deposit, China

PEI NI[1] AND A.H.RANKIN[2]

[1]Department of Earth Science, Nanjing University, Nanjing 210093,China(peini@nju.edu.cn)

[2] School of Earth Science and Geography, Kingston University, Kingston upon Thames, Surrey KT1 2EE,UK (a.rankin@kingston.ac.uk)

The Fe-Nb-REE deposit at Bayan Obo, Innermogolia, China, is the world's largest REE resource. It occurred in dolomite, and has been interpreted as being formed by multiple episodes of hydrothermal activity. Here we present some new data on the fluid(melt) geochemistry to suggest that a possible magmatic process may have been involved in the deposit formation.

New Data of Immiscible REE-rich melt in melt Inclusion of Host Dolomite

Some melt inclusions in host dolomite which was not overprinted by later hydrothermal event were identified first time. Within them, Some typical features of coexisting of two immiscible melt can be determined, One of them enrich in REE, and the other is poor in REE. A lot of microthermometry, SEM-EDS and Laser Raman analysis works have been done on these melt inclusions.

Conclusions and Disscusions

Recognizing first time of melt inclusions and immiscibility process in host dolomite of Bayan Obo Fe-Nb-REE deposit gives two following possibility:1.The host dolomite is possibly carbonatitic origin. Which is consistent with recent work done by Le Bas et al.(1997).2.REE-rich melt could unmix from primary carbonatitic magma during the magmatic differentiation process, and cause REE concentration in Bayan Obo. The present study suggests that carbonatitic magma could play an important role in REE enrichment, and a possible magmatic origin may have been involved in the formation of Bayan Obo Fe-Nb-REE deposit.

Acknowledgment

NSFC of China(Project number: 49973002) and Honorary researcher fellowship of Kingston University jointly supported this research work. Many thanks go to Bill Edwards for help with SEM-EDS facilities at Kingston.

References

Yuan Z., Bai G., Wu C., Zhang Z., and Ye X.(1992), *Appl.Geochem.*7,429-442

Le Bas M.J.,Spiro B.,Yang XM.(1997), *Mineral. Mag.*61,531-541.