New ^{142}Nd data on SNC meteorites

E. JAGOUTZ, G. DREIBUS, R. JOTTER

Max-Planck-Institut für Chemie Mainz Saarstrasse 23
jagoutz@mpch-mainz.mpg.de,

A common depleted reservoir differentiated at 4.3 ±2 Ga was proposed for all SNC meteorites containing an excess in ^{142}Nd. This was in line with the primitive Sr isotopic initials of these meteorites and the low μ (^{238}U/^{204}Pb). To verify this assumption a refinement of the ^{142}Nd measurements was necessary.

SNC meteorites are very valuable and therefore we are using only sample saving methods in order to preserve this unique rocks for further investigations. Consequently we have measured Nd isotopes as NdO^+ ions which is a much more sensitive method than measuring metal ions. While measuring ^{143}Nd, we routinely measure all Nd isotopes in order to control the oxygen fractionation in the TIM-masspec. From this measurement we used to estimate the ^{142}Nd. However, for the last two years we improved our ^{142}Nd routine. It was also necessary to improve the chemical routine in order to avoid Ce interferences.

Using the new setup we find for SaU 005 ε_{142}=0,22±0,16 and for DaG 476 ε_{142}=0,40±0,26. These values are still having an additional uncertainty of ±0,10 since the standard value is not precise enough yet.

Recently, Kleine et al. determined the ^{182}W in the picritic olivine rich DaG 476 and SaU 005, which also shows no ^{182}W excess and now these two meteorites fit into the correlation found in the diagram of ε_{142} versus ε_{182}.

From our study of desert alteration products we know that Nd as well as W are candidates of terrestrial contamination. In the case of Nd we are planing to measure contamination free samples for ^{142}Nd. Only then we can exclude that ^{142}Nd is obscured by terrestrial contamination. We will design a leaching procedure to get most of the terrestrial contamination of those SNC meteorites which are coming from the hot desserts.

The Pb-Pb initial of Sau 005 and Nakhlites plot on the geochron indicating that their reservoirs were part of the early differentiation.

The important observation here is that DaG 476 and SaU 005 originating from a depleted reservoir - as indicated by their primitive Sr and Pb-Pb initials - have no significant ^{142}Nd. Therefore, we have to postulate two depleted reservoirs on Mars. However, a time difference of about 400 Ma ($T_{1/2}$ = 103 Ma for ^{142}Nd) for these reservoirs would be the utmost limit considering the Pb-Pb initials. The different exposure ages of Nakhlites and Chassigny with excess ^{142}Nd of 11 Ma and the ^{142}Nd free DaG 476 and SaU 005 of ca. 1 Ma could indicate also two different areas on Mars from which these meteorites were ejected.

References

Kleine T., Münker C., Mezger K., Palme H. and Bischoff A. (2003), *Geophys. Res. Abstract*, **Vol 5**, 11656

Lanthanide tetrad effect in granites and related rocks from China and Mongolia: A review

BOR-MING JAHN[1] AND FUYUAN WU[2]

[1] Department of Geosciences, National Taiwan University, Box 13-318, Taipei, Taiwan (jahn@ccms.ntu.edu.tw)
[2] Institute of Geology & Geophysics, CAS, Box 9825, Beijing 100029, China (wufuyuan@mail.igcas.ac.cn)

The lanthanide tetrad effect in natural rock samples has been progressively identified in the past few years. The effect appears most recognizable in highly differentiated granitic rocks which are generally intruded at high crustal levels, and are often accompanied by important rare-metal and REE mineralizations. We have studied four plutons from NE China (intrusive ages in parentheses) - Woduhe (130 ± 4 Ma), Baerze (122 ± 5 Ma), Dongqing (162 ± 4 Ma), and Xiangshuiyuanzi (183 ± 3 Ma), one pluton from East Junggar Terrane (ca. 300 Ma), and an ongonite dyke from west-central Mongolia (120 ± 1 Ma). All of them are highly siliceous (SiO_2 = 70-78%), and often enriched in volatiles such as H_2O, F, Cl, Li, B and P. In addition, they all belong to A-type granite, and show peraluminous or peralkaline (minor) nature. These rocks exhibit clear tetrad effect on their REE patterns, and non-CHARAC (charge-and-radius-controlled) behavior of many diadochic trace elements. Except Baerzhe, the granites have relatively low REE abundances (often 10-20 x chon.) with huge negative Eu anomalies. The Baerzhe peralkaline granites are exceptional, and are enriched in REE (200 to 1500x chon.), forming a very large REE-Nb-Be-Zr deposit. Isotopically, the Mesozoic granites from NE China and ongonite from Mongolia have near-zero εNd(T) values (-0.7 to +2), whereas the alkaline granites from East Junggar show highly positive value of ca. +7. This suggests that the sources for these granites are generally quite juvenile, not recycled Precambrian crust. Their initial Sr isotope ratios cannot be precisely determined due to their high Rb/Sr ratios, but the face values are in general low (≤ 0.706). At present, the mechanism for creation of the tetrad effect is not fully understood. Interaction between late-stage magma and hydrous fluid enriched in F-Cl-(Li) is considered to be the most viable process, but how precisely REE's are complexed remains unclear. Proposed mechanism involving low-T water-rock interaction (e.g., Takahashi et al., 2002) does not seem appropriate with geological considerations of the rock assemblages. Oxygen isotope data of the Woduhe and Baerzhe granites indicate significant ^{18}O depletion in feldspar, but not so much in quartz, suggesting that the hydrothermal alteration took place in a low-temperature condition of 300-500°C. This process is decoupled from the high temperature magma-fluid interaction.