Isotope diluted neutron activation analysis (ID-NAA) for quantitative analysis of PGEs and Re

T. TANAKA, R. SENDA, S. SHIBATA, M. MINAMI AND M. TANIMIZU

Dept. Earth and Environmental Sci., Nagoya Univ., Nagoya 464-8602 Japan (tanaka@eps.nagoya-u.ac.jp)

Why ID-NAA?

Though PGEs and Re are the useful elements in earth sciences, the quantitative analysis responsible for geological bulk materials is difficult. The reason is in the heterogeneity and low abundances of the elements in geological samples. NAA is convenient and cheap in the present research society, but the PGE recovery is hardly convinced without tough work RNAA. ID-MS may clear the insufficient recovery, but the tool is expensive.

Method and Result

Some of the PGEs, Ru, Os, Ir, and Re have more than two stable isotopes activable by neutron. A series of experiment; addition of the spike isotope - preconcentration of PGEs by the fire assay - neutron activation analysis (ID-NAA) allow us the quantitative analysis.

Sufficient amounts (20~60g) of powdered rock are treated by the conventional NiS fire assay technique. Enriched stable isotopes ^{187}Re, ^{184}Os and ^{193}Ir are mixed with samples as spikes before the fire assay. HCl-treated material is filtered and the insoluble residue (PGE with Au, Ag, NiS and so on) is recovered on a 0.2_m Teflon membrane filter. The recovered material is sealed in a pure quartz tube together with the Teflon filter.

The _-ray intensities, e.g. 646.1keV of ^{185}Os and 129.4keV of ^{191}Os for osmium are measured. The relative intensities, however, vary according the irradiation and cooling conditions, even if two samples have the same sample/spike ratio. Various mixtures of spike and known amount of natural reagents are irradiated together with unknown samples. The samples are irradiated for 6 hours in JRR-4 reactor of Japan Atomic Research Institute under the neutron flux of $4\_10^{17} m^{-2}s^{-1}$ and then_-ray is measured twice after 3 days and 6 days cooling. The appropriate decay correction is done for each _-ray. The spike/natural ratios of unknown samples are obtained by the comparison with the calibration line. Elemental abundances are then obtained. The results are agrees within a few percent variations for repeated analysis using different amount of samples.

Longer irradiation and more sensitive _-ray counting will make us enable to determine very tiny PGEs quantitatively. Ruthenium also can be measured under the shorter cooling period after the irradiation. ID-INAA will provide us reliable PGE data at the reasonable cost.

Climate Changes In Southwest China During The Past 700 Years

S.L. TANG, J.A. CHEN

State Key Lab of Environmental Geochemistry, Institute of Geochemistry,
Chinese Academy of Sciences, Guiyang 550002, Guizhou Province, China (jinganchen@hotmail.com)

Lacustrine sediment, recording much information of regional climate and environment with annual to decade resolution, is one of the excellent archives in studying short-time-scale climatic changes. Considering the scarce and poor investigation on the paleoclimate in the southwest monsoon region in China, we selected two Lakes (Lake Erhai and Lake Chenghai) in Southwest China to carry out this study. Based on fine dissection and discrimination of sediment grain sizes and $\delta^{18}O$, $\delta^{13}C$ of sediment carbonates, the evolutionary history of the regional climate in recent 700 years is reconstructed. The following conclusions are drawn:

(i) The basic climate succession type in Southwest China is warm-dry and cool-humid alternately. This may unfold the different climatic feature in the southwest monsoon region from that in the southeast monsoon region where the climate combination type is warm-humid and cool-dry by turns.

(ii)There exist 200 and 400 years quasi-periodical changes in temperature and 100, 200 and 400 years quasi-periodical changes in aridity/humidity regime.

(iii) The 14th century and 1550_1800AD are the two coldest periods in recent 700 years, the latter of which may be the imprint left in Southwest China by the Little Ice Age. From the end of the 19th century until 1940, the regional climate had been becoming warmer and warmer, in accordance with the global warming during the corresponding period. Afterwards, there occurred about 40-year cooling trend and at the early 1980s the temperature began to rise again, which is in agreement with the instrumental record in the region.