Measurements of chemical compositions of magnetic spherules separated from deep sea sediment dredged off Hawaii island by NAA

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Chemical compositions of magnetic spherules ,which were collected from the deep sea sediments dredged off Hawaii islands, were measured by Instrumental Neutron Activation Analysis (INAA) using Kyoto University Reactor (KUR) in Research Reactor Institute, Kyoto University.

In this study, we measured the chemical compositions of Fe, Co, Ni, Sc and Ir of fourteen magnetic spherules (1.5-115.5 micro-g).   The neutron irradiation was carried out for 50 min using the pneumatic transport system of No. 2 in KUR, whose neutron flux is 2.75E+13 (neutrons per square centimeter per second).

As a result, Fe and Co contents were determined to be 7.32-82.2 %, and 30.0-5200 ppm, respectively, in almost all spherules.   Ni, Sc, Ir contents were determined to be 0.78-5.17 % in 9 out of 14 spherules, 4.20-40.0 ppm in 7, and 0.71-19.7 ppm in 6, respectively.

The detection limits for these elements in KUR were estimated to be 0.22 micro-g in Fe, 0.31   ng in Co, 0.039 micro-g in Ni, 0.035 ng in Sc, and 0.0058 ng in Ir.   Consequently, it was found that INAA technique in KUR gave higher sensitivity in the determination than those obtained by Kobayashi and Ebihara using the TRIGA MARK II reactor in Institute for Atomic Energy, Rikkyo University.

Further measurements for similar spherule samples by INAA are currently in progress in our group.