Report for ISEI's collaboration Program

Oxygen isotope compositions of NWA539 ordinary chondrite

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Host: M. Kusakabe
Period: 13 February – 20 February 2005

NWA539 is one of many meteorites found in dessert of North Western Africa and classified as LL3.5 by A.E Rubin (personal communication) based on petrological characteristics. The meteorite is composed of chondrules (more than 80 vol.%) of various sizes and matrix. A fine-grained clast (~ 1cm x 0.5cm) was found in the meteorite that is very similar to matrix materials in unequilibrated chondrite. Oxygen isotopic compositions of several individual grains using Secondary Ion Mass Spectrometry (SIMS) have been measured (Choi et al., 2003), whereas no bulk oxygen data have been produced. Spot analyses by SIMS show that some olivine grains have oxygen isotopes of carbonaceous chondrites (i.e., negative $\Delta^{17}O$), while majority of data fall near the terrestrial mass fractionation line.

In order to measure oxygen isotopic compositions of chondrules, the fine-grained clast and whole rock of NWA539, three relatively large (2-5 mm in diameter) chondrules, four broken pieces from the clast and three chips that composed of small chondrules and matrix were prepared. The last ones may represent the bulk (?) of NWA539. Typical weights are ~ 2 mg.

Oxygen isotopic compositions of these samples were measured using Laser-fluorination technique at Prof. Kusakabe's laboratory. All measurements of NWA539 fall in the range that occupied by previously measured oxygen isotopic compositions of ordinary chondrites (Fig. 1). These oxygen data along with petrological observation show that NWA539 is an 'ordinary' unequilibrated ordinary chondrite. The SIMS and Laser-fluorination data show that there are large variations in oxygen isotopic compositions even in ordinary chondrites, although the samples having large $\Delta^{17}O$ values are very rare.

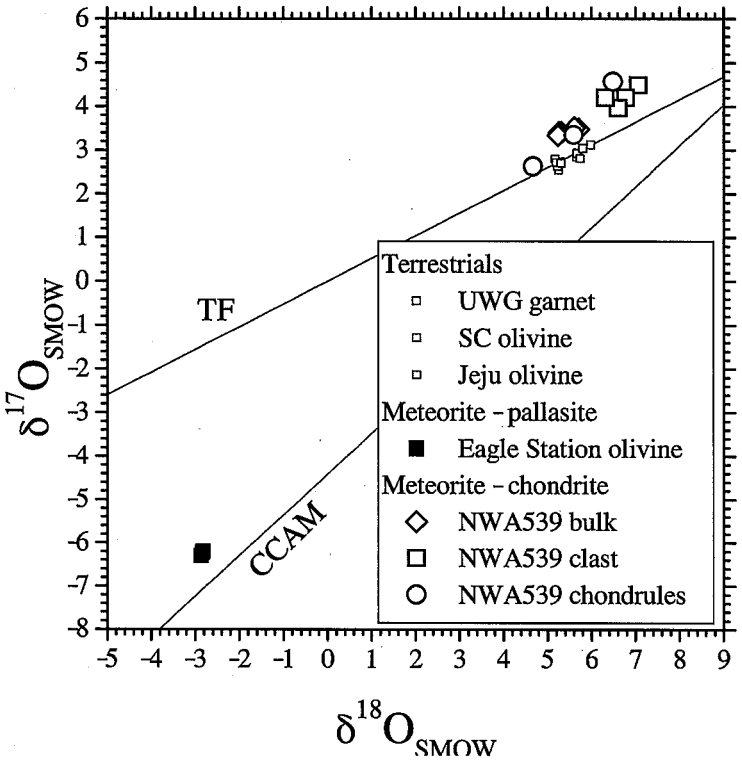

Fig.1. Summary of oxygen isotopic compositions measured during 14 to 17 February 2005 at ISEI.