BULK OXYGEN-ISOTOPE COMPOSITIONS OF EQUILIBRATED ORDINARY CHONDRITE FALLS USING CO$_2$ LASER-BrF$_5$ FLUORINATION TECHNIQUE.

I. Ahn$^{1,2}$, B.-G. Choi$^1$, C. K. Park$^1$, J. I. Lee$^3$, J. T. Wasson$^3$,
$^1$Earth Sci. Ed. Seoul Nat’l Univ., Seoul, Korea, 151-748. E-mail: breeze94@kopri.re.kr, $^2$Korea Polar Research Institute, Incheon, 406-840, Korea, $^3$IGPP, UCLA, Los Angeles, CA 90095, USA.

We measured O-isotopic compositions of equilibrated ordinary chondrites (EOCs) using the CO$_2$ laser-BrF$_5$ fluorination technique at Korea Polar Research Institute. Fifty one EOC falls from UCLA collections were selected for this study. About 30-50 mg from each chondrite was gently crushed using agate mortar and pestle. About 2 mm-size fragment each was used to make polished thick sections. We observed terrestrial weathering products in 5 EOCs. Their O-isotope compositions differ (higher in $\delta^{18}$O and lower in $\Delta^{17}$O) from those of the others, also indicating that terrestrial contamination. Thus we discuss only the 46 fresh EOCs: 10 H, 17 L, 4 L/LL and 15 LL chondrites.

Three or more samples, each about 2-mg of non-magnetic fractions washed with dilute acid were analyzed using the analytical procedures similar to those described in [1].

Results are generally similar to [2] but differ in details. The highlights of the observations follow: (1) our data define a much sharper mixing trend than those of [2]. Variation of $\delta^{18}$O at a given $\Delta^{17}$O is small in the low $\Delta^{17}$O end (H-group) and becomes larger in high $\Delta^{17}$O end (LL-group). It is plausible that the correlated changes in O-isotopic composition and degree of oxidation of OCs is related, possibly because the oxidizing agent and the high $\Delta^{17}$O materials were in the same water-bearing nebular component [3,4]. It seems possible that the spread in $\delta^{18}$O at constant $\Delta^{17}$O is related to the partial loss of this component during thermal metamorphism. If we ignore six type-4 LLs and two L/LLs with high $\delta^{18}$O (>5‰) the other 38 EOCs form a well defined linear array with a slope close to unity. The line intersects with CCAM line [5] at $\delta^{18}$O = $\delta^{17}$O = -50‰. This is further evidence that the O-isotopic composition of chondritic matter was largely controlled by mixing of two reservoirs that fall along the slope-1 line differing greatly in their $\Delta^{17}$O values. (2) Our L and LL data are marginally separated but our L/LL data scatter widely; we assume that the latter is a stochastic effect. (3) There are correlations between $\Delta^{17}$O values and some bulk volatiles and siderophiles [6]; e.g., positively with Ga and Zn, negatively with As, Au, Ir and Os. (4) A positive correlation between Co in kamacite and fayalite contents (fa) of OCs has been known [7]. The high-Co (>100 mg/g) and high-fa (>31 mol.%) LL members generally have higher $\Delta^{17}$O values. They have low contents of metallic iron and are the most oxidized LL chondrites.