OXYGEN ISOTOPIC RELATIONSHIPS BETWEEN THE LEW85332 CARBONACEOUS CHONDRITE AND CR CHONDRITES. M. Prinz[1], M. K. Weisberg[1], R.N. Clayton[2] and T.K. Mayeda[2]. (1) Dept. Mineral Sci., Amer. Museum Nat. Hist., New York, NY 10024. (2) Enrico Fermi Inst., Univ. Chicago, Chicago, IL 60637.

LEW85332, originally described as a unique C3 chondrite [1], was shown to be a C2 chondrite with important linkages to the CR clan (CR chondrites, ALH85085, Acfer 182) [2]. An important petrologic aspect of LEW85332 is that it contains anhydrous chondrules and hydrated matrix, and new oxygen isotopic data on chondrules, matrix and whole rock are consistent with the petrology. Chondrules fall on the equilibrated chondrite line (ECL), with a slope near 1, which goes through ordinary chondrite chondrules. This contrasts with the CR chondrule line which has a lower slope due to hydrated components. LEW85332 chondrules define a new carbonaceous chondrite chondrule line, parallel to the anhydrous CV chondrule line (CCC), consistent with the well-established concept of two oxygen isotopic reservoirs. Matrix and whole rock fall on the CR line. The whole rock composition indicates that the chondrite is dominated by chondrules, and that most of them contain light oxygen similar to that of anhydrous olivine and pyroxene separates in the Renazzo and Al Rais CR chondrites.

INTRODUCTION. CR chondrites have been studied extensively [3] and it has been shown that the oxygen isotopic compositions of chondrules, matrices and whole rocks fall on a CR mixing line with a slope near 0.7. Since all anhydrous chondrules in ordinary and carbonaceous chondrites fall on lines with a slope near 1 (Fig. 2), indicative of two oxygen isotopic reservoirs, the CR chondrules indicate an additional oxygen source. This has been considered to be water since the CR chondrules are hydrated to varying degrees. It has been shown that LEW85332 is a member of the CR clan because it has significant chemical similarities to the CR group (e.g., oxygen and nitrogen isotopic compositions), although it does have different petrologic characteristics [2]. The chondrules are smaller (average, 170 μm) than in CR chondrites (up to 1cm), but more importantly they are anhydrous. However, the matrix which occurs interstitially, as clasts and as chondrule rims, is hydrous [2,4]. Matrix consists of phyllosilicates (mainly saponite and serpentine) and magnetite framboids. Thus, the purpose of this study was to extract chondrules and matrix from LEW85332 in order to measure their oxygen isotopic compositions and determine the oxygen reservoirs of the anydrous chondrules as compared to the hydrous matrix. In this way it would be possible to determine the pre-hydration oxygen isotopic composition of the related CR chondrules.

RESULTS. Oxygen isotopic data are presented in Table 1 and Figs. 1 and 2. Whole rock data were presented earlier [2], but because the sample is weathered a second sample was HCl-washed and analyzed; both data points are presented. The HCl-washed sample did not move the analysis in the usual direction for weathered Antarctic samples, i.e., parallel to the terrestrial fractionation line; perhaps an indigenous component was removed. Chondrules C1, C3 and C5 represent single chondrules, whereas C4 is a composite of 3 smaller chondrules; thus 6 chondrules are represented. The surprising result is that not only do they fall on a line with a slope near 1 (as predicted), but that they fall on the ECL line (Fig. 1). Ordinary chondrite chondrules also fall on this line [5] (Fig. 2), and thus LEW85332 chondrules fall on an extrapolation of the ordinary chondrite chondrule line, towards lighter oxygen, and two overlap with ordinary chondrite chondrules. This line is parallel to the anhydrous carbonaceous chondrite chondrule (CCC) line. Seventeen chondrules from CR chondrites [3] are also shown in Fig. 2 and they fall on a line with a slope < 1 (near 0.7). Since the LEW85332 chondrules fall on a slope~1 line (ECL line), it is inferred that the pre-hydrous alteration CR chondrule line probably also had a slope close to 1, similar to the LEW85332 trend. This is somewhat supported by the anhydrous olivine and pyroxene separates (Fig. 1), probably derived from chondrules. They contain lighter oxygen than that in the CR chondrules, and are similar to the LEW85332 whole rock and some of the chondrules. A single matrix sample was extracted, and it falls on the CR mixing line (Fig. 1), indicative of its hydrous nature.

Thus, LEW85332 contains anhydrous chondrules whose oxygen isotopes fall on a slope 1 line (same as ordinary chondrite chondrules) indicative of two oxygen isotope reservoirs, and the matrix falls on the CR line (slope 0.7) which contains hydrous components representing a third oxygen isotopic source (water). The whole rock composition falls near the intersection of these two lines. Anhydrous phases in CR chondrules may also fall on a slope 1 line. The coexistence of anhydrous chondrules and hydrated matrix in LEW85332 (as well as in Acfer 182 and ALH85085) highlights the problem of nebular vs. parent body hydrous alteration.

References: [1] Rubin, A.E. and Kallemeyn, G.W. (1990) Meteoritics 25, 215-225. [2] Prinz, M. et al. (1992) Meteoritics 27, 278-279. [3] Weisberg, M.K. et al. (1993) The CR (Renazzo-type) carbonaceous chondrite group and its implications, GCA, in press. [4] Brearley, A. (1992) LPSC XXIII, 155-156. [5] Clayton, R.N. et al. (1991) GCA 55, 2317-2337.

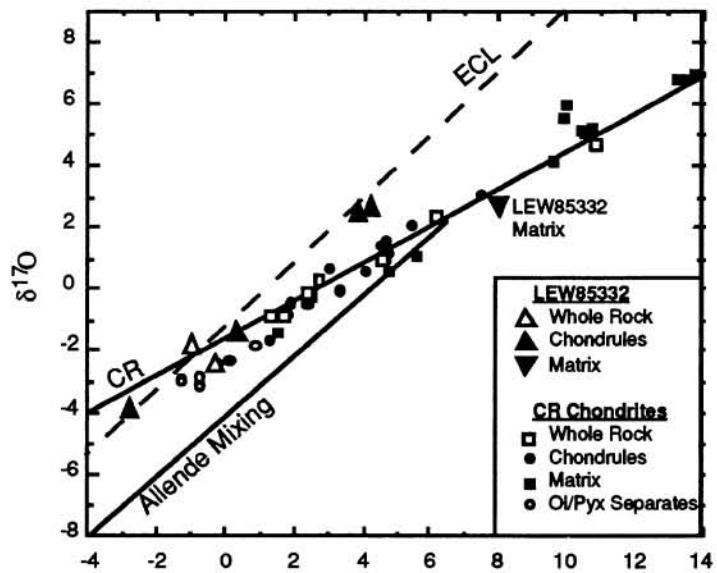

Fig. 1

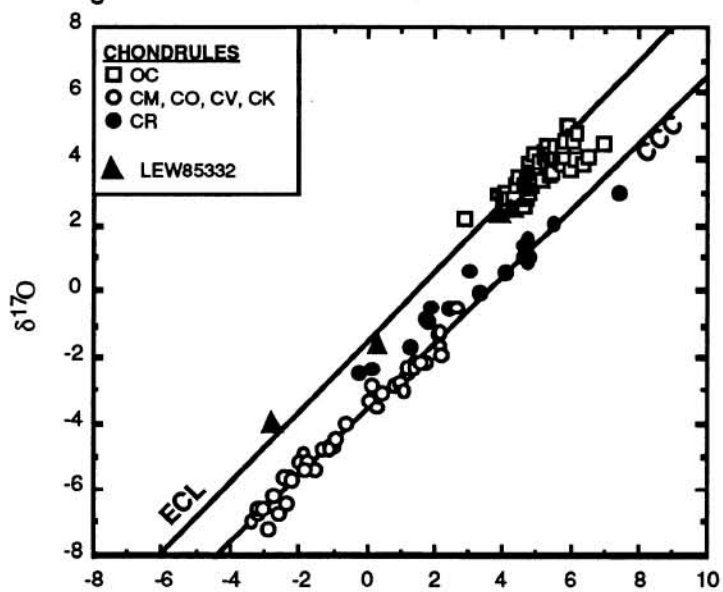

Fig. 2

Table 1. Oxygen isotopic compositions of LEW85332 whole rock, chondrules and matrix.

	$\delta^{18}O$	$\delta^{17}O$
Whole Rock	-0.92	-1.93
Whole Rock (HCl)	-0.23	-2.54
Chondrules		
C1	4.31	2.54
C3	-2.76	-3.98
C4 (3 chondrules)	0.36	-1.52
C5	3.89	2.39
Matrix	8.06	2.54