BULK COMPOSITION OF MATRIX AND CHONDRULE RIMS FOR FOUR CARBONACEOUS CHONDRITES; M.E. Zolensky[1], R.A. Barrett[2] and J.L. Gooding[1], [1]NASA, Johnson Space Center, Houston, TX, [2]Lockheed-EMSCO, 2400 NASA Rd. 1, Houston, TX.

INTRODUCTION As part of our continuing attempts to unravel the histories of the carbonaceous chondrites we have performed representative analyses of fine-grained matrix, and fine-grained chondrule rims from three meteorites which span the compositional range exhibited by the CM chondrites, Murchison, Bells and Nogoya, and one CV chondrite, Allende.

PROCEDURE All analyses were performed employing a Princeton Gamma Tech (PGT) EDX attachment to a JEOL 35C SEM at 20kV with a 5µm beam raster, which excited a ~15µm-square subsurface area at each sample spot. Standard PGT quantitative data reduction programs were used, employing appropriate natural mineral standards. The number of analyses performed upon each chondrite was: Murchison, 30 matrix analyses, 55 rim analyses (9 rims); Bells, 24, 103 (10); Nogoya, 30, 62 (9); Allende, 25, 32 (4).

RESULTS The analytical results are presented in Figures 1 and 2. In Figure 1, the fields defined by all matrix and rim analyses for each chondrite are shown projected onto reduced-area Fe-Si-Mg ternary diagrams. For all CM chondrites, the fields defined by the matrix analyses are subsets of the fields defined by the corresponding rim analyses. By comparison, the matrix and rim compositional fields are virtually identical for Allende.

DISCUSSION The congruence between the composition of Allende matrix and rim material implies that Allende matrix (which has been suggested as the possible precursor material for CM matrix material [1]) and Allende rim material are directly related. If rim material predates incorporation of the enclosed chondrules into the matrix (as has been suggested [2]) then Allende matrix could have been derived predominantly from the disaggregation of chondrule rims. A similar process could have produced CM matrix from CM chondule rims, with matrix mixing "averaging" the composition of matrix relative to rim material. This suggestion is supported by the fact that the average matrix and rim compositions are similar for each chondrite (see Figure 2a). Figure 2b compares the compositional range of Murchison rim material with nearly 500 defocused beam matrix analyses from 15 non-Antarctic CMs reported by McSween [1]. The fields are virtually identical; similar results are obtained using rim data from Bells and Nogoya. Similar results are also suggested by the data of Metzler and Bischoff [3]. The gross rim compositional zoning reported by Metzler and Bischoff has not been observed in our study, but we did find gross inter-rim compositional differences (within the same meteorite) to be common.

These results suggest that the initial composition of disaggregating chondrule rim material present locally in the CM parent body(ies) may have had a major (perhaps dominant) influence upon the bulk composition of the resultant CM matrix material. This compositional trend would have been modified by the compositional changes proposed to accompany aqueous alteration of matrix material [1, 4]. Thus Murchison matrix, with an average bulk composition more Fe-rich than Allende's (see Figure 2a) might be so because comparatively more Fe-rich chondrule rim material was incorporated locally into the CM parent body regolith from which Murchison was ultimately derived. By a similar process, Nogoya inherited an Fe-poor matrix composition from a proportionately larger share of relatively Fe-poor chondrule rim material. The mineralogy of chondrule rims has not been sufficiently diagnosed to permit detailed comparison to matrix mineralogy.

REFERENCES [1] McSween (1987) GCA 51:2469; [2] Scott et al. (1984) GCA 48: 1741; [3] Metzler and Bischoff (1987) Meteoritics 22:in press; [4] Zolensky and McSween (1988) in: Meteorites and the Early Solar System, in press.

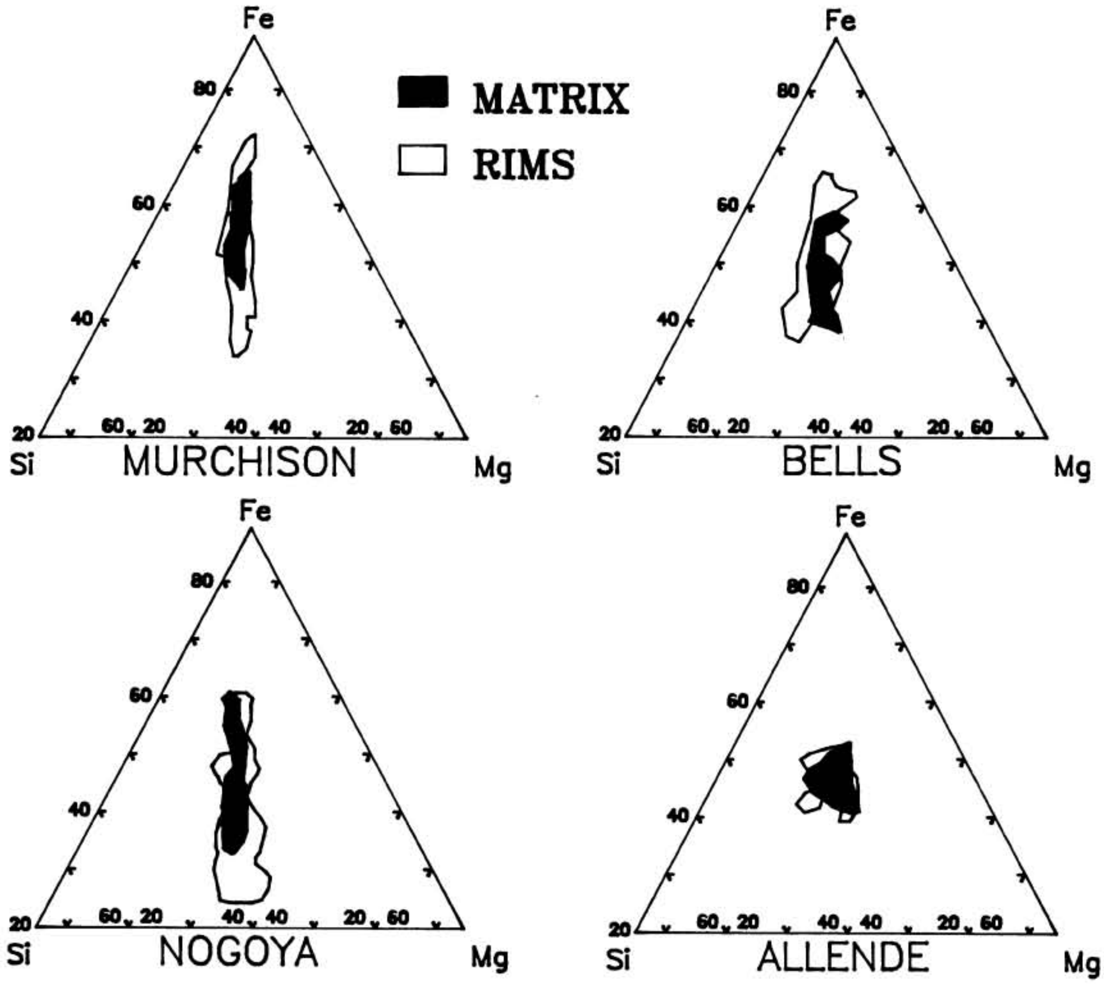
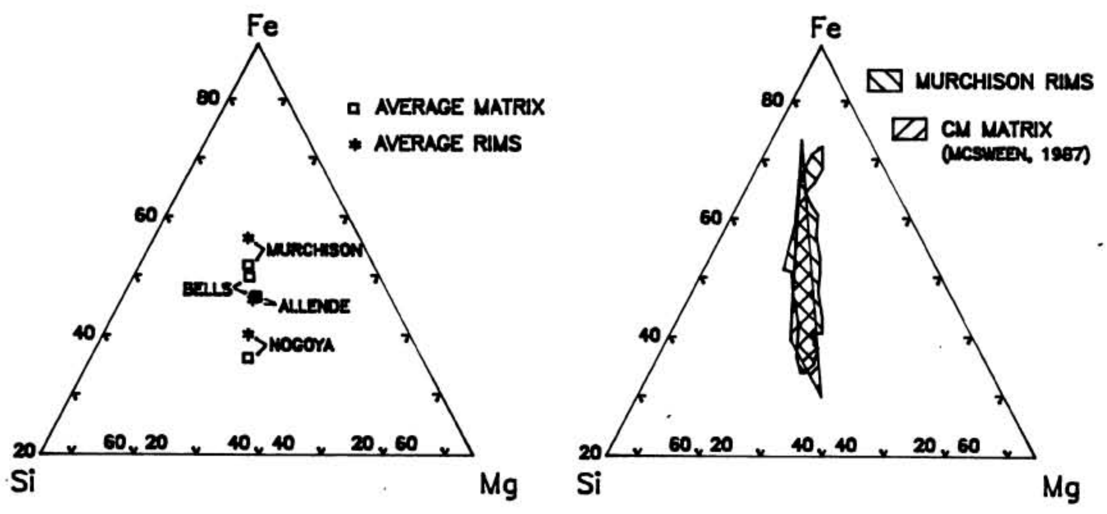


Figure 1



a b

Figure 2