MATRIX AND RIM COMPOSITIONS COMPARED FOR 13 CARBONACEOUS CHONDRITE METEORITES AND CLASTS

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INTRODUCTION An important goal in studies of carbonaceous chondrites is to understand the genetic relationships among the various materials that occur together in those breccias. Lately, our work on these meteorites has concerned the bulk composition of the matrix and adjacent dark, compact rims on chondrules and aggregates. We have previously compared bulk-elemental compositions of matrices and rims in each of four chondrites, Allende (CV3), Murchison, Nogoya and Bells (CM2) [1]. We report here the results for six more chondrites, Vigarano (CV3), EET 83389 (CM2), EET 83334 (probable CM1), Orgueil (CI1), Ivuna (CI1), Yamato 82162 (probable CI2, see [2, 3]). We also report the results for CM2 and CI1 clasts in the Bholghati howardite, and a probable CI2 clast in the Al Rais chondrite, which are more fully described in a companion abstract [4]. All analyses were performed using quantitative SEM-EDX procedures developed in our laboratory [1]. The number of separate analyses for each meteorite ranged from 25-43 for matrix and 32-103 for rims. The small size of the clasts permitted fewer analyses.

RESULTS The compositional ranges of the matrix and rim analyses for each meteorite (or clast) are shown on Fe-Si-Mg ternary diagrams in Figure 1. With the exception of the probable CM1 EET 83334, the compositional variation of the rims (where present) is always significantly greater than that of the matrix analyses for the same meteorite, as we previously inferred for CV3 and CM2 chondrites [1]. It appears that the matrix compositions in EET 83334 span the same range as for its rims, but discovery and analysis of additional CM1 chondrites will be necessary to determine whether this attribute is real.

The average matrix and rim compositions for each meteorite are plotted together on a Fe-Si-Mg ternary diagram in Figure 1. For the meteorites with chondrule/aggregate rims, the average compositions of the rims are generally very similar to the respective matrix compositions. No general compositional trend exists between the rims and repective matrices. The greatest compositional difference between rims and matrix is observed for Nogoya, in which the average rim composition is very similar to that of CI matrix material. We are performing microstructural and mineralogical studies of Nogoya rim and matrix materials to elucidate that effect.

We find that average matrix compositions can generally be used to discriminate among groups of carbonaceous chondrites, when they are displayed on a diagram plotting S/Si vs. Fe/Si, such as in Figure 3. The trends seen on this diagram are primarily due to two factors: (1) much of the Fe in the CI chondrites being tied up in coarse-grained magnetite and sulfides, rather than matrix phyllosilicates, tochilinite and anhydrous silicates as in the CM, CO, CR and CV chondrites [5-6], and (2) the presence of generally greater amounts of matrix sulfides in the CI, CM and CR chondrites rather than in the relatively volatile deficient CV and CO chondrites. Only the CV and CO chondrites are not well resolved on this diagram.

REFERENCES [1] Zolensky et al. (1987) Lunar Planet. Sci. XIX, 1327-1328; [2] Zolensky et al. (1989) this volume; [3] Tomeoka et al. (1988) 13th Symp. Antarc. Meteorites, 126-127; [4] Zolensky and Barrett (1989) this volume; [5] McSween and Richardson (1977) Geochim. Cosmochim. Acta 41, 1145-1161; [6] McSween (1987) Geochim. Cosmochim. Acta 51, 2469-2477.

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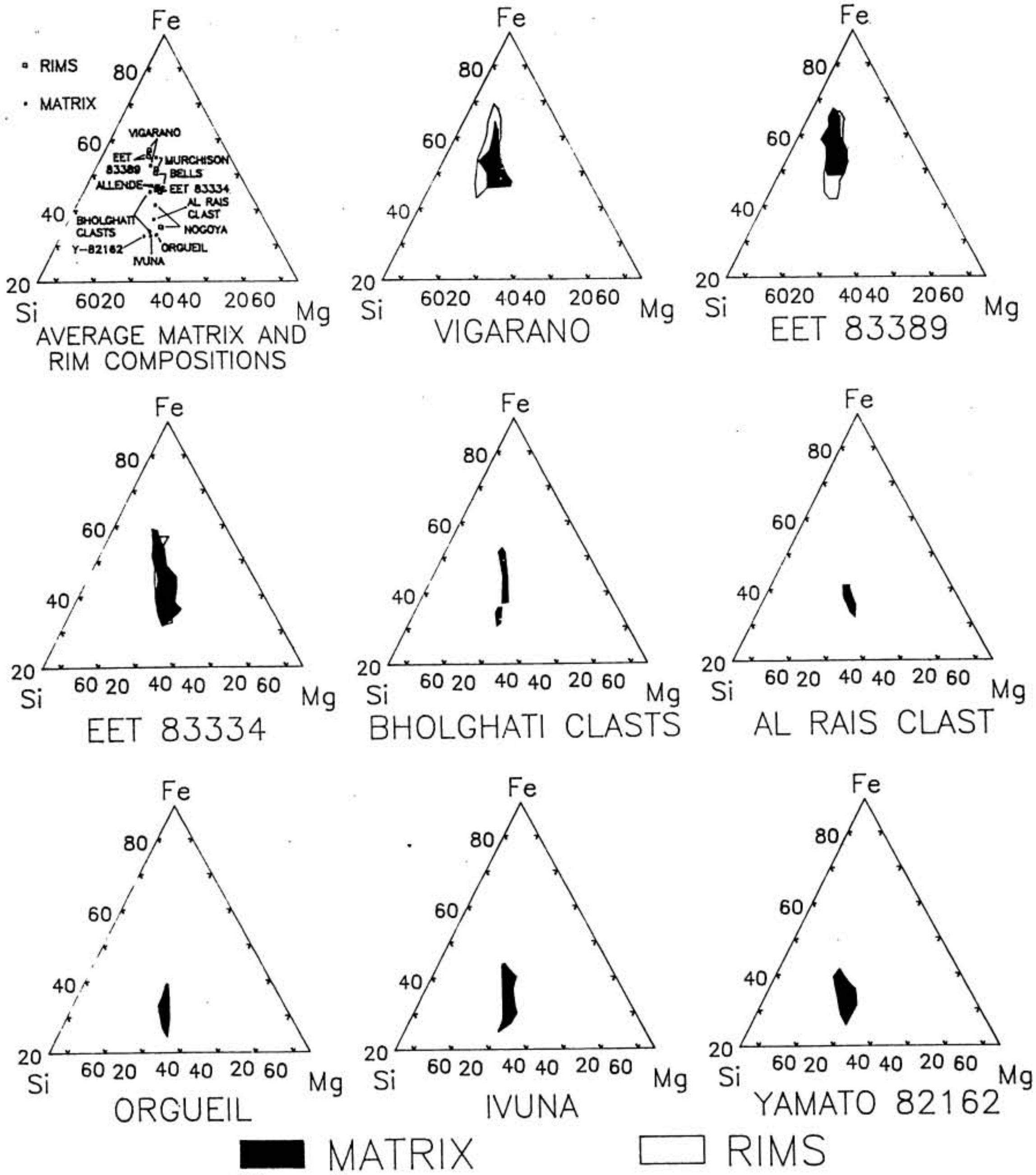

Figure 1

Figure 2