TRACE ELEMENT AND REE ANALYSES FROM THE BISHOPVILLE AND NORTON COUNTY ENSTATITE ACHONDRITES.

M.M.Strait.
Center for Meteorite Studies, Arizona State University, Tempe,AZ

Trace element and rare earth data from two aubrites, Norton County and Bishopville, have been collected in order to examine variations in composition within the aubrites and to attempt to establish a relationship between the aubrites and a possible enstatite chondrite material. Models for the derivation of the aubrites from the fractional crystallization of an enstatite chondrite parent material have been proposed by Watters and Prinz (1) and Biswas, et al. (2). Watters and Prinz (1) use data from the bulk chemistry of the silicate portions and major and minor phases of the aubrites to propose fractional crystallization as a mechanism for the formation of the aubrites. Using another set of trace elements, mineralogic and isotopic data, Biswas, et al. (2) link all enstatite meteorites to a common parent body and propose a fractional crystallization process as responsible for the derivation of the aubrites from this enstatite parent body.

Hand-picked samples of the matrix and mineral clasts from Bishopville and Norton County were analyzed for Fe, Na, Ca, La, Ce, Nd, Sm, Eu, Tb, Yb, Lu, Cr, Co, Ni, Sr, Ba, Sc, Hf, Ta, U, Zr, Rb, Cs, and Zn by neutron activation analysis. (Table 1) Element concentrations for both Bishopville and Norton County occur in two distinct groups. Norton County shows higher Fe, Ca and S concentrations and a lower Na concentration than Bishopville. The rare earth element patterns (Figs. 1 and 2) exhibit an expected dichotomy in abundances between the matrix and the clasts, the enstatite clasts being depleted relative to the matrix. Norton County samples show a negative Eu anomaly, while Bishopville has a positive one.

The compositional differences between Bishopville and Norton County might be explained by placing the two meteorites at different positions within a fractionation sequence. If the aubrites crystallized from a melt, the data are consistent with Norton County forming early in the fractionation and Bishopville at a later point. Norton County contains greater amounts of FeS, olivine and diopside, and lower proportions of plagioclase. Rare earth data supports this trend; the negative Eu anomaly of Norton County is indicative of early crystallization from a melt. The larger amount of plagioclase and its resultant positive Eu anomaly places Bishopville at a much later point in the trend. The rare earth and trace element results are in agreement with a fractionation trend involving crystallization of the aubrites from an enstatite chondrite parent melt.

References: (1) Watters, T.R. and Prinz, M. (1979) Proc. Lunar Planet. Sci. Conf. 10th, pp. 1073-1093. (2) Biswas, S. et al (1980) Geochim. Cosmochim. Acta 44,pp. 2097-2110. (3) Moore, C.B. et al (1980) Meteoritics 15, p. 334.

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TRACE ELEMENTS IN ENSTATITE ACHONDRITES

Strait, M.M.

Table 1

Concentration Ranges in Norton County and Bishopville

Element	Norton County (5 samples)	Bishopville (25 samples)
Fe	0.44-0.82%	0.13-0.74%
Na	0.049-0.153%	0.062-2.287%
Ca	0.17%	0.07-0.14%
Cr	119.6-756.8 ppm	92.9-792.7 ppm
Co	1.09-7.70 ppm	0.57-12.76 ppm
Ni	41.9-207.2 ppm	25.8-156.1 ppm
Sc	6.8-7.5 ppm	5.4-9.0 ppm
S	10000 ppm 0-11000 ppm(3)	2000-7000 ppm(3)

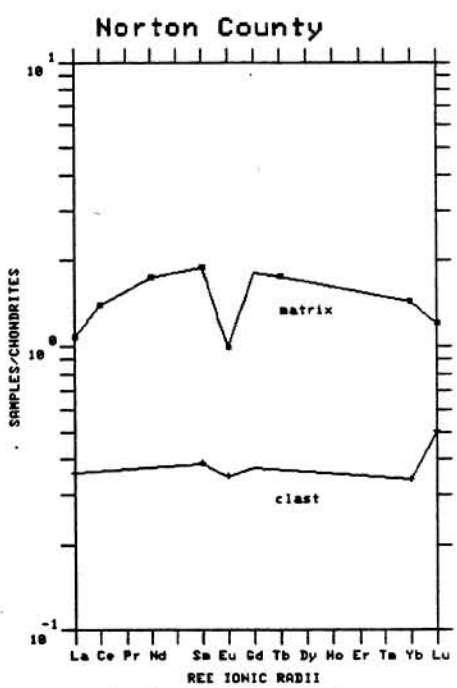

Fig. 1. REE data for a representative matrix and clast sample of Norton County.

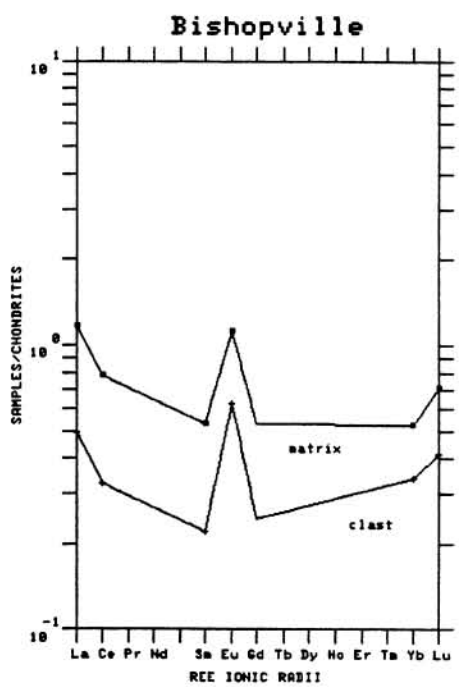

Fig. 2. REE data for a representative matrix and clast sample of Bishopville.

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