REE, Ba, Sr AND Rb IN THE YAMATO METEORITES, WITH SPECIAL REFERENCE TO YAMATO-691(a), -692(b) AND -693(c)

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Abstract: Following the previous analyses (MASUDA *et al.*, 1977) of Yamato-7301(j), -7305(k) and -7304(m) meteorites for REE, Ba, Sr and Rb, other three meteorites Yamato-691(a), -692(b) and -693(c) were studied here for the same elements, employing the stable isotope dilution. [These three meteorites are enstatite chondrite, Ca-poor hypersthene achondrite and Type III carbonaceous chondrites (NAGATA, 1975).]

1. Introduction

In December 1969, nine meteorites were found by a party of the 10th Japanese Antarctic Research Expedition (KUSUNOKI, 1975). Very recently, MASUDA *et al.* (1977) determined REE, Ba, Sr and Rb in Yamato-7301(j), -7305(k) and -7304(m) meteorites by mass-spectrometric stable isotope dilution technique, and concluded that, of these three ordinary chondrites, the Yamato-7305 meteorite can be regarded as closest to the primary unfractionated one, and that melting took place for chondrites studied. By employing the same experimental method, we have determined the above elements in Yamato-691(a), -692(b) and -693(c).

SHIMA *et al.* (1973) measured rare gas content of Yamato-691, -692, -693 and -694(d) meteorites. Lately, SHIMA and SHIMA (1975) summarized their studies on these four meteorites, including analyses for bulk chemical composition.

2. Results and Dsicussion

In Table 1 are presented the results of our determination of REE, Ba, Sr and Rb for Yamato-691, -692 and -693, together with the previous associated data; the abundances of REE and Ba in the Leedey chondrite are taken as normalizing values.

The Leedey-normalized REE pattern for Yamato-692, Ca-poor hypersthene achondrite, is similar to that for hypersthene achondrite Shalka investigated by

Table 1. Abundances (ppm) of REE, Rb, Sr and Ba in Yamato meteorities.

	Yamato-691	Yamato-692	Yamato-693$_1$ (c_1)	Yamato-693$_2$ (c_2)	Yamato-7301$_1$*	Yamato-7301$_2$*	Yamato-7305*	Yamato-7304*	Leedey**
La	0.224	0.0160	0.447	0.492	0.403	0.530	0.3625	0.401	0.378
Ce	0.633	0.0397	1.142	1.241	0.963	1.245	0.942	1.024	0.976
Nd	0.473	0.0297	0.880	0.927	0.611	0.745	0.695	0.730	0.716
Sm	0.153	0.0107	0.286	0.295	0.1848	0.211	0.2259	0.2280	0.230
Eu	0.0551	0.00249	0.109	0.1065	0.0623	0.0666	0.0743	0.0831	0.0866
Gd	0.217	0.0206	0.376	0.394	0.255	0.266	0.310	0.310	0.311
Dy	0.269	0.0417	0.461	0.476	0.308	0.316	0.374	0.369	0.390
Er	0.178	0.0429	0.297	0.308	0.1984	0.2019	0.2433	0.2374	0.255
Yb	0.170	0.0681	0.293	0.302	0.190		0.238	0.231	0.249
Lu	0.0272	0.0127	0.0469	0.0475	0.0316	0.0314	0.0371	0.0355	0.0387
Ba	2.93	0.255	4.31			16.1	3.67	4.80	4.21
Sr	7.6	0.54	13.0				8.87	10.45	
Rb	7.5	0.35	1.56				2.40	2.28	
Amount taken (mg)	568.1	380.2	529.0	333.4	281.5	547.1	686.2	670.6	

* MASUDA *et al.* (1977).

** MASUDA *et al.* (1973) and NAKAMURA (1974). MASUDA (1975) presented the following abundances for monoisotopic REE as consistent with the measured values for Leedey ; Pr 0.136, Tb 0.0589, Ho 0.0888 and Tm 0.0385, respectively.

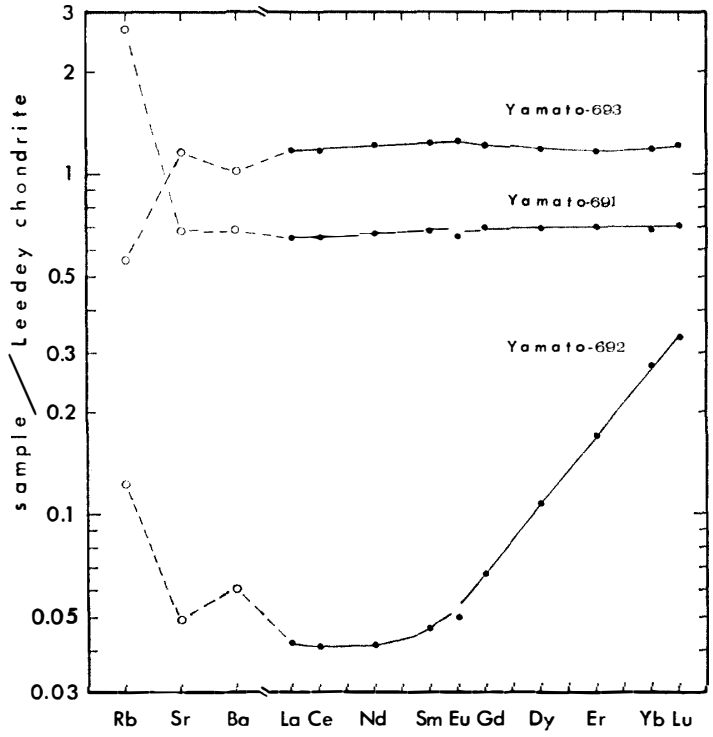

Fig. 1. Leedey-normalized REE patterns plus Rb-Sr-Ba patterns, for Yamato-691, -692 and -693.

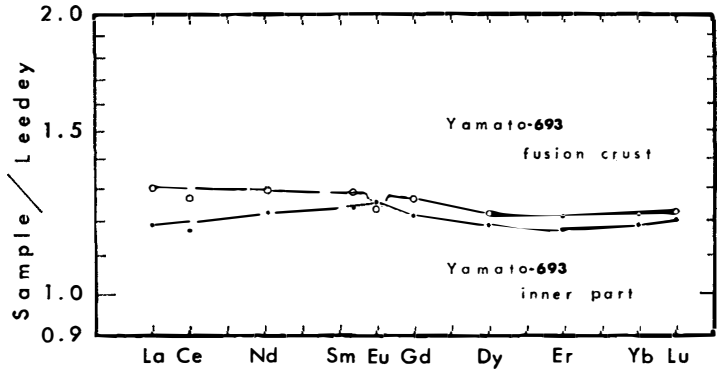

Fig. 2. Leedey-normalized REE patterns for Yamato-693 meteorite.

SCHMITT *et al.* (1963). As shown in Fig. 1, the Yamato-692 pattern appears to be composed of a rectilinear, sharply inclined segment from Lu through Gd and a substantially horizontal part from Nd through La, with a presumably curved intermediate joining these two segments. Similar, though somewhat different, features were noticed for enstatite single crystals picked up from the Norton County achondrite (MASUDA, 1968).

For the Yamato-693 chondrite (Type III carbonaceous chondrite), two portions were investigated; 693_1 (c_1) is from the inner part and 693_2 (c_2) represents the outermost part including 60–70% fusion crust material. The REE pattern in

Fig. 1 is that of 693_1, but the patterns for 693_1 and 693_2 are shown in Fig. 2. We understand that the difference in REE abundances between the two portions is intrinsic one, not having anything to do with the process of the formation of fusion crust. The REE pattern for this meteorite appears rectilinear for the span from La to Gd (or Eu), excepting Ce, and somewhat concave for the range from Gd (or Eu) through Lu. The degrees of Ce depletion are 2 ± 0.5 and $3\pm0.5\%$ for 693_1 and 693_2, respectively.

The Leedey-normalized REE pattern for Yamato-691 is composed of two rectilinear segments, a slightly inclined one from La through Sm and a horizontal one from Gd through Lu. There appears a very slight discontinuity between these segments.

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