CHONDRULE CORES AND RIMS FROM THE TIESCHITZ(H3.6) CHONDRITE

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Chondrule cores and rims have been extensively studied(1-5), but poorly known for trace element chemical features, particularly for REE. In this study, in order to investigate trace element characteristics, cores and rims of Tieschitz (H3.6) chondrules were analyzed for REE, K, Rb, Sr, Ba, Ca and Mg by direct loading mass spectrometric isotope dilution technique with precisions of 1 - 3 % for LREE and 3 - 5 % for HREE. The preliminary results were reported by Nagamoto et al.(6). Here, we report results for individual chondrule core and rim materials from eleven Tieschitz chondrules.

As already reported (6) the K abundances in bulk Tieschitz chondrules are significantly depleted compared with those of typical Ordinary chondrites(830 ppm). Fig. 1 shows K vs. CI-normalized (Rb/K) diagram indicating the relation between rim and core. It is found that K is relatively enriched in chondrule rims (283-706 ppm) but is significantly depleted in chondrule cores (104-180 ppm). Similar result is reported for Semarkona (LL 3.0) chondrule rim and core (7). It is interesting that the chondrule rims have roughly CI (Rb/K) ratio, though the ratios are scattered, but the chondrule cores clearly show the higher Rb/K ratio than CI chondrite.

Depletion of alkalis and the fractionated (Rb/K) in chondrule cores suggest that chondrule cores were formed from alkali poor precursors and/or alkalis were lost from cores during the chondrule-formation melting. Complementary alkali distributions between cores and rims suggest that a part of the vaporized materials from chondrule cores recondensed as rim materials.

Fig. 2 shows the REE patterns of chondrule cores and rims, respectively. Chondrule rims have 1-2 x CI REE abundances and show uniformly flat patterns with negative Eu anomalies except for T-19. On the other hand, chondrule cores have more variable REE abundances ranging from 1 to 4 times CI chondrite. The similar result was also found for Chainpur (LL3.4) chondrules(4). T-19 is a coarse-grained rim. T-35 which consists of white radial pyroxene around the dark radial pyroxene core may not be chondrule rim but may be assigned to a mantle. Some samples show the HREE enrichment. T-36 chondrule rim has positive Ce and Eu anomalies, indicating that REE in this rim was established under oxidizing condition. It is pointed out that positive and negative Eu anomalies, and REE abundance variations are not related with textural types of chondrules. The variable REE abundances with positive and negative Eu anomalies of cores suggests that the chondrule cores were not formed under uniform physico-chemical conditions. Chondrule-rims and cores show different trends in a CI-normalized (K/Mg) vs. (Sm/Mg) diagram (Fig. 3).

From the above result, it is suggested that chondrule rims were formed from precursor materials with higher alkali contents and positive Eu anomaly, on the contrary chondrule cores were formed from complemental precursor materials or represent residual materials lost alkalis and the relatively volatile REE(Eu) in a complemental way during chondrule formation melting.

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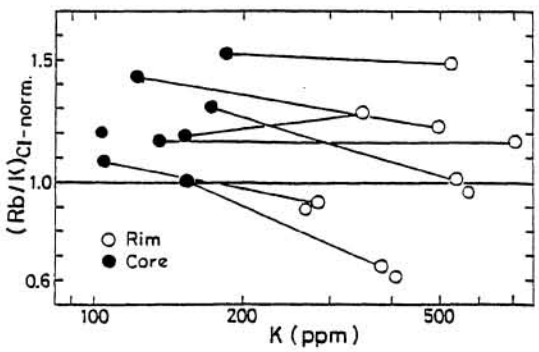

Figure 1. The relation of K content vs. CI normalized (Rb/K) between the chondrule rims and cores from Tieschitz. The diagram contains seven pairs of chondrule rim and core, one core and three rims. Solid and open circles show the chondrule core and rim, respectively.

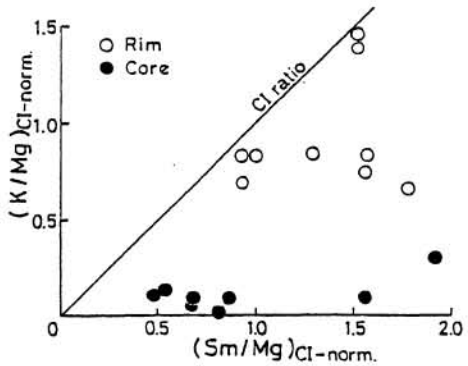

Figure 3. Plot of CI-normalized (K/Rb) vs. (Sm/Mg) for chondrule rims and cores from Tieschitz.

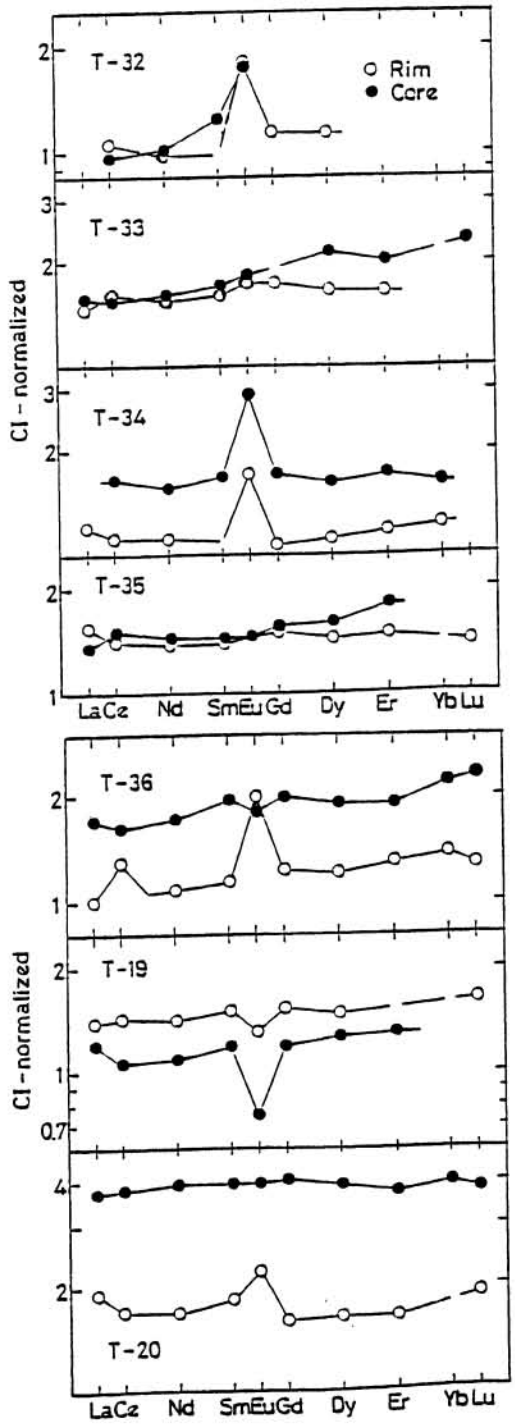

Figure 2. CI-normalized REE patterns of chondrule rims and cores from Tieschitz.