Ba isotopic heterogeniety in the solar system

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Ba has seven stable isotopes consisting of p-, s-, and r-process nucleosynthetic origin. Most previous Ba isotopic studies of meteorites focused on the variation of r- and s-process nucleosynthetic components due to additional inputs in the early solar system. ^{135}Ba and ^{137}Ba isotopes are sensitive to s- and r-process variations, and often have deficits and/or excesses in chemical separates and whole rocks in carbonaceous chondrites due to the existence of presolar grains [1] [2]. Furthermore, the isotopic variation due to the existence of presolar grains gives disadvantages to find the contribution of the isotopic excess of ^{135}Ba decayed from the presently extinct radioisotope ^{135}Cs ($t_{1/2}$=2.3 Ma). However, as a particular case, barium isotopic composition of the chemical separates from chondrules in the Sayama CM2 chondrite shows the excess of ^{135}Ba isotopic abundance up to (0.33 ± 0.06) %, which is independent of the isotopic components from s- and r-process nucleosyntheses [3]. The isotopic excesses of ^{135}Ba correlate with the elemental abundance of Ba relative to Cs, showing chemical and isotopic evidence for the existence of presently extinct radionuclide ^{135}Cs in the early solar system. Similar isotopic excess of ^{135}Ba is also found in some Allende CV3 CAIs [4].

Meanwhile, Ba isotopic deviation patterns of eucrites show much flatter than those in carbonaceous chondrites, and little evidence for additional nucleosynthetic components and radiogenic ^{135}Ba decayed from extinct ^{135}Cs. The results conclude that the isotopic information of the additional nucleosynthetic components disappears during the evolution process of eucrites.

[1] Hidaka *et al.* (2003) *EPSL* **214,** 455-466. [2] Carlson *et al.* (2007) *Science* **316,** 1175-1178. [3] Hidaka and Yoneda (2013) *Sci. Rep.* **3,** 1330. [4] Bermingham *et al.* (2014) *GCA* **133,** 463-478.