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Sm-Nd SYSTEM IN SINGLE CHONDRULES FROM TIESCHITZ (H3).

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Abstract. We investigated the Sm-Nd system in single chondrules from the Tieschitz (H3) meteorite. An isochran obtained for some chondrules yielded an age of 2.04 Ga, and a chondritic initial ratio. This isochron probably dated the timing of chondrule alteration. Some of the chondrules fall on 4.55 Ga reference isochron. The fractionation of the REE for one of them was caused by a process in the solar nebula at the time of chondrule formaton.

Chondrules are characteristic of chondrites, the most primitive rocks in the Solar System. Chondrites are as old as the Solar System and have chemical compositions that are directly related to that of the sun.However, in contrast to the bulk composition, the constituents of chondrites - chondrules, rock and mineral fragments, inclusions, matrix, etc., - are chemically fractionated compared to the sun.

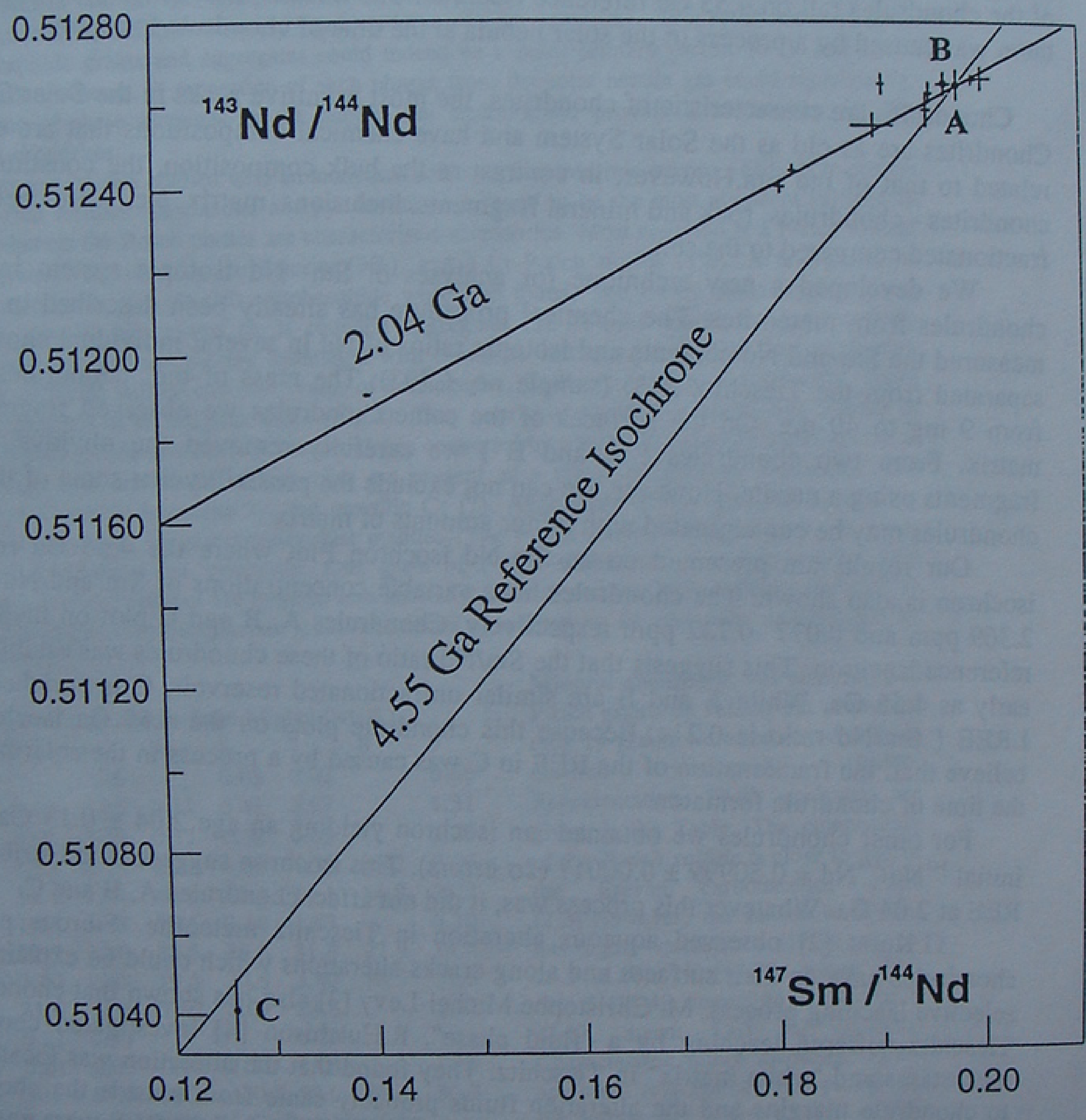
We developed a new technique for analyses of Sm- Nd isotopic system in single chondrules from meteorites. The chemical procedure has already been described in [1].We measured the Sm and Nd contents and isotopic ratios of Nd in several individual chondrules, separated from the Tieschitz (H3) (sample no. C793). The mass of the chondrules varied from 9 mg to 40 mg. On the surfaces of the some chondrules we observed fragments of matrix. From two chondrules (A and B) we carefully removed the obviovs matrix fragments using a needle. However, we can not exclude the possibility that some of the other chondrules may be contaminated with minor amounts of matrix.

Our results are presented on an Sm-Nd isochron Plot where the 4.55 Ga reference isochron is also shown. The chondrules have variable concentrations of Sm and Nd: 0.260-2.369 ppm and 0.077 -0.732 ppm respectively. Chondrules A, B and C plot on the 4.55 Ga reference isochron. This suggests that the Sm/Nd ratio of these chondrules was established as early as 4.55 Ga. While A and B are similar unfractionated reservoir, C is enriched in the LREE (Sm/Nd ratio is 0.214).Because this chondrule plots on the 4.55 Ga isochron, we believe that. the fractionation of the REE in C was caused by a process in the solar nebula at the time of chondrule formaton.

For other chondrules we obtained an isochron yielding an age 2.04 ± 0.13 Ga and an initial $^{143}Nd/^{144}Nd = 0.50999 \pm 0.00017$ (2σ errors). This isochron suggests a redistribution of REE at 2.04 Ga. Whatever this process was, it did not affect chondrules A, B and C.

G.Kurat [2] observed aqueous alteration in Tieschitz meteorite. Fibrous pyroxene chondrules have on their surfaces and along cracks alterations which could be explained by a selective leaching process. M. Christophe Michel-Levy [3] also has shown that chondrules in Tieschitz suffered leaching by a "fluid phase". R.Hutchison [4] investigated chondrules, mesostases and "white matrix" in Tieschitz. They found that the alteration was located close to chondrule margins and the alteration fluids probably came from outside the chondrules. The alteration enriched the mesostases in F, Cl, K, Rb, and Ba , but the REE were unaffected. White matrix outside the chondrules has different degrees of REE depletion, but authors suggest that REE do not seem have been lost from chondrules.

As noted above, there may be matrix contamination of these chondrules. Thus we can not conclude now whether the 2.04 Ga isochron dates the process of chondrule alteration [2,3,4] or only alteration of the matrix [4]. According to our results, the initial ε_{Nd} value of the 2.04 Ga isochron is equal to the chondritic value. (ε_{Nd}= -0.1) This may imply that the redistribution of the REE at 2.04 Ga involved only chondritic neodymium.



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