Sm-Nd SYSTEM IN SINGLE CHONDRULES FROM BJURBOLE L4 CHONDRITE. N. Krestina[1], E. Jagoutz[2], G.Kurat[3]
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In our previous work [1] we presented data on the Sm-Nd isotopic system in individual chondrules, matrix, and the whole rock from the unequilibrated H/L3.6 ordinary chondrite Tieschitz (sample C793).

The obtained results are presented in Fig. 1; the 4.55 Ga reference isochron is shown for comparison. The chondrules data reveals the form of an isochron which yields an age of 2.040±13 Ga and an initial $^{143}Nd/^{144}Nd$ of 0.50999 ± 0.00017. We suggest that the age of 2.04 Ga corresponds to the time of the alteration. The data points out that the chondrules with removed matrix reveal nearly chondritic values and plot on both 4.55 Ga reference isochron and 2.04 Ga isochron. The matrix data poin plots on the 2.04 Ga isochron. This suggests that the alteration process would have affected the matrix. On the other hand the matrix data point falls between those for the chondrules contaminated with the matrix material (the matrix has not been removed from their surface). This may indicate that the alteration process could also have affected the chondrules, or that the matrix sample is not representative. Thus, it is difficult to determine whether or not the alteration process affected the chondrules.

The nature of the alteration process not known yet. It may be related either to the preaccretionary Fe-Mg exchange("equilibration") event [2], or to a leaching event [3], or to apostaccretionary mobilisation event. In order to find a solution to this puzzle, chondrules from a variety of chondrites have to be analysed.

We continued our study with the Bjurbole (L) chondrite. This has been chosen because it is very friable and, therefore, chondrules are easily accessible. Most chondrites are compact and their chondrules are much more difficult to extract. Furthermore, Bjurbole chondrules show chemical fractionation which is related to the bulk SiO2 content [4]: SiO2-poor chondrules have negatively correlated Ca and Al contents (typical for equilibrated chondrites) whereas SiO2-rich ones have positively correlated Ca and Al contents (typical for unequilibrated chondrites). Our analysis may provide us with information about the time when these fractionation processes were active.

Ten single chondrules were separated from Bjurbole using a needle. Five out of 10 chondrules are POP, 4 are RP,and 1 is PO. We have also analysed a rock fragment and a matrix sample from Bjurbole . The mass of the chondrules varied from 3 mg to 16 mg The chemical procedure has been described previously [5]. The chondrules were cleaned to remove the adhering matrix and split into two samples. One sample was processed for the Sm-Nd analysis [1], and the other one was saved for future geochemical and petrologic studies. According to [6,7] the thickness of fine-grained rims in ordinary chondrites generally varies from 10 to 30 μm, while that of coarse-grained rims averages 150 μm. From several chondrules (mean size is 2 mm) we removed 50% of the total weight so that we were able to analyse the cores of chondrules. Five chondrules were analysed without removing the matrix.

The K-Ar age for the whole rock of Bjurbole is 4.51±0.08Ga [8]. The study of the U-Th-Pb system in seven L chondrites including Bjurbole was completed by [9]. The Bjurbole isochron yielded an age of 4.590±0.006 Ga. Since this age is older than those for the other L chondrites (4.55 Ga) it was suggested that the age is an artefact due toproblems in the correction procedure or it is a result of a recent geologic disturbance of the U-Th-Pb system, or terrestrial U loss [9]. In [10] the Rb- Sr system has been studied in several chondrules, the matrix, nonmagnetic fraction, medium magnetic fraction, and the whole rock of Bjurbole. All data points, except that for the whole rock, are shifted from the reference 4.55 isochron and do not yield any correlation. It was suggested that the Rb-Sr system would have been disturbed due to a seawater alteration during the terrestrial exposure of the meteorite.

Our results for Bjurbole meteorite are presented in Fig.2, wherethe 4.55 Ga reference isochron is also shown for comparison. The chondruleshave variable concentrations of Sm and Nd :from 0.13 to 0.59 ppm and from0.30 to 1.23 ppm, respectively. Compared to our data on Tieschitz (Fig.1), the chondrules from Bjurbole are much more fractionated: the $^{143}Nd/^{144}Nd$ratios vary from 0.5123 to 0.5140. The data point for several chondrules are shifted to the right from the 4.55 Ga reference isochron, however, the $^{143}Nd/^{144}Nd$ values remain closed totoday's Nd isotopic composition in CHUR. This may be explained by analteration process which did not change the isotopic composition of Nd but did change the Sm/Nd ratios. In contrast to the Tieschitz data, the matrix data point for Bjurbole plots on 4.55 Ga reference isochrone. We assume that the matrix would not have been affected

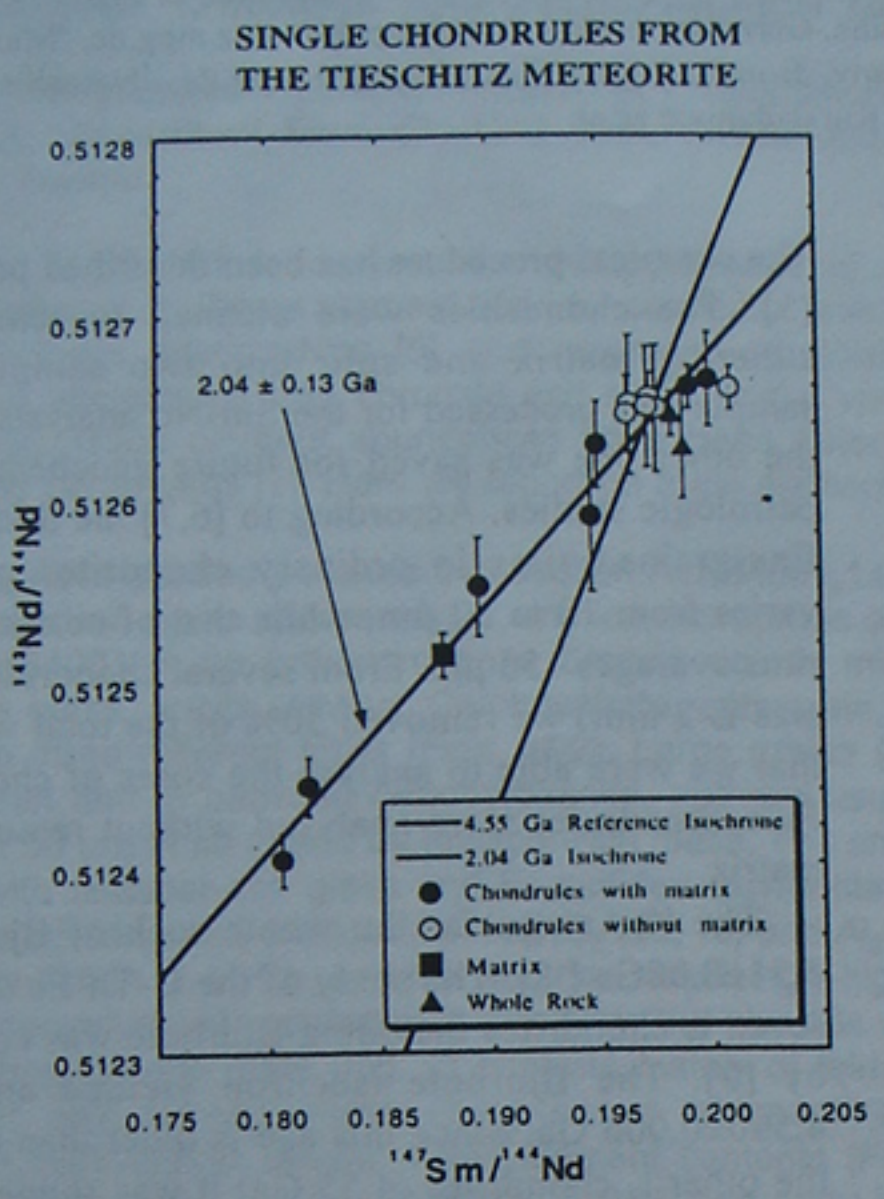

Fig. 1

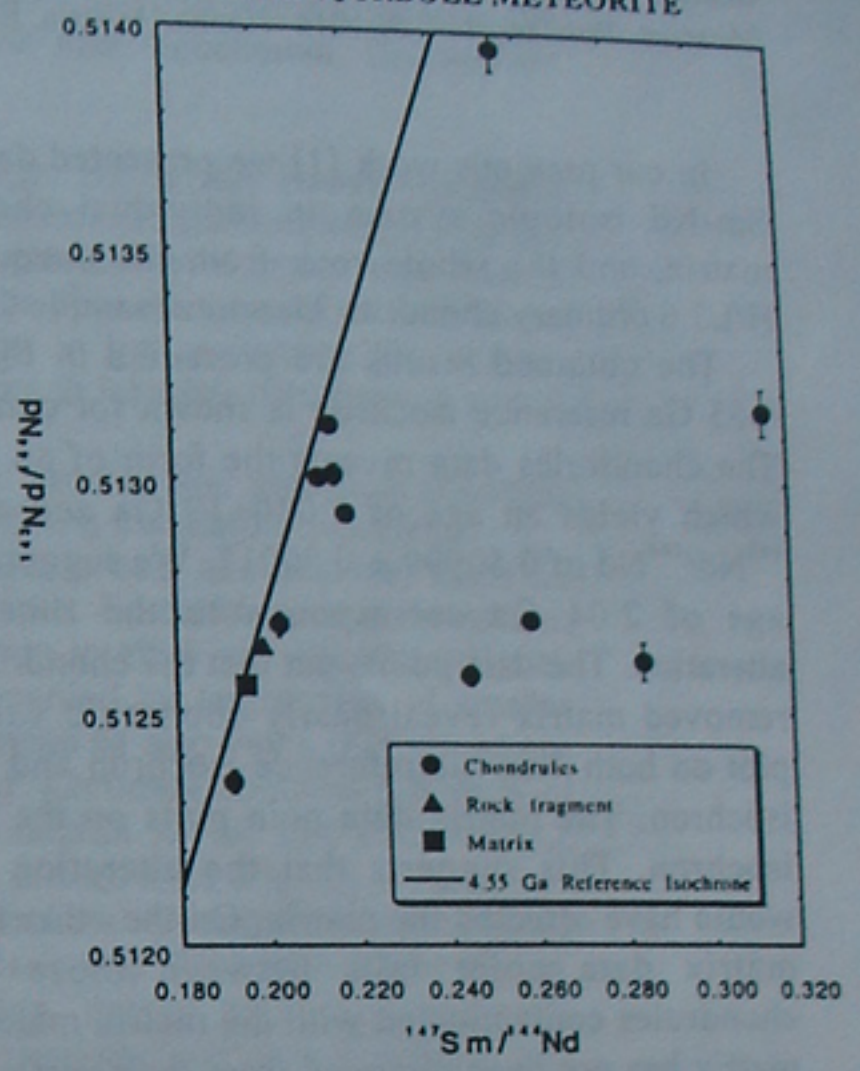

Fig. 2

by this alteration process. Thus it was concurred that the alteration process would have affected the chondrules leaving matrix intact.

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