SAYAMA METEORITE: A NEW CM CHONDRITE FALL IN JAPAN WITH HIGHLY AQUEOUSLY ALTERED TEXTURES. S. Yoneda¹, M. Ebihara², Y. Oura², A.Okada³, M. Kusakabe⁴, T. Nakamura⁵, K. Nagao⁶, and H. Naraoka², ¹National Science Museum, Shinjuku, Tokyo 169-0073, Japan (s-yoneda@kahaku.go.jp), ²Tokyo Metropolitan Univ., Hachioji, Tokyo 192-0397, Japan, ³RIKEN, Wako, Saitama 351-0198, Japan, ⁴Okayama Univ., Misasa, Tottori 682-0193, Japan, ⁵Kyushu Univ., Higashi, Fukuoka 812-8581, Japan, ⁶Univ. of Tokyo, Bunkyo, Tokyo 113-0033, Japan.

Introduction: We report a new CM chondrite fall in Japan. The Sayama meteorite fell at Sayama-city, Saitama-prefecture, Japan in 1986 and was recently brought to the National Science Museum, where it was recognized as a carbonaceous chondrite. It weighs 430g and is almost entirely covered by the fusion crust.

Circumstances of Recovery: In the morning on or about April 29, 1986, a stone was found near the entrance porch of the finder's house. He didn't pick it up for fear of radioactivity because the news of the accident of Chernobyl nuclear reactor was just broadcast in Japan. A few days later, it rained and the next-door neighbor found a leak in their roof. The meteorite apparently hit the roof of the next door and fell on the ground of the finder's house. At this point the finder decided to pick it up but the meteorite had already soaked up the rainwater. When it became dry, the fusion crust became cracked (Fig. 1).

Textures: The inside predominantly consists of black matrix and no large chondrules or inclusions are seen. Optical microscope and SEM studies show that Sayama experienced extensive aqueous alteration than typical CM2 chondrites like those in [1]. Most of primary minerals in chondrules are replaced by phyllosilicates. Irregular-shaped relict olivine crystals are found in some chondrules (Fig. 2) and fayalite contents in olivine range from 0 to 23%. Metal is very



Fig. 1. Sayama meteorite (scale: cm)

rare and only found as tiny grains encapsulated in relict olivine. PCP is also rare in the matrix but well crystallized phyllosilicates (probably serpentine), sulfides and Mg-Ca carbonates (dolomite) are ubiquitous. Since some chondrules contain relict olivine, the petrographic type 2 is assigned. It is, however, most likely intermediate between type 1 and type 2 as are ALH 83100 and Y 82042 [1].

Cosmogenic Nuclides: Al-26 was first detected by a pure Ge coaxial γ -ray detector. Assuming the K content is same as the average CM chondrites (407 ppm), Al-26 is calculated to 35.7 \pm 1.8 dpm/kg, which is not saturated. Noble gases were also analyzed and abundant trapped gases were detected. From cosmogenic He-3 and Ne-21, the exposure age of Sayama is estimated to be less than 1Myr. This is consistent with the Al-26 undersaturation.

Light Elements and Isotopes: Carbon, hydrogen, nitrogen and sulfur contents were determined by conventional method. The results, C: 1.99 wt%, H: 1.37 wt%, N: 0.08 wt% and S: 2.6 wt%, are in good agreement with average CM compositions. Two determinations of carbon isotopes gave $\delta^{13}C = +2.9$ and +6.1 permil. This is quite high among CM and other carbonaceous chondrites and could be due to high abundance of carbonates. For highly-hydrated CM chondrite Y 82042, +9.8 permil is also reported by [2]. The oxygen isotopic compositions were deter-

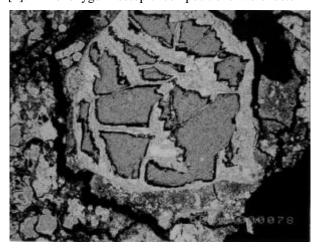


Fig. 2. A chondrule with relict olivine (BEI; 0.4 mm)

SAYAMA METEORITE: A NEW CM FALL WITH HIGHLY AQUEOUSLY ALTERED TEXTURES: S. Yoneda et al.

mined using a laser reaction chamber with sample sizes of a few mg. The results are plotted in Fig. 3. The Sayama data fall on the O-16 poor end of the CM whole rock range. As repetitive precision is about 0.1 permil, scattering of data indicates inhomogeneity of the sample. Some of the samples might be matrix-rich. Or it could be a result of a high water/rock ratio at the aqueous alteration [3].

Major and Trace Element Abundances: strumental Photon Activation Analysis (IPAA) was employed for the elemental abundance determination. The CI and Si-normalized abundances are plotted in Fig. 4. The data points fit closely with the CM average compositions with the exception of alkaline elements Na and Rb. Na depletion and K enrichment were also observed in the EET 83334 CM1 chondrite and Kaidun CM1 lithology, respectively, but not both simultaneously [1]. Although mobilization of alkaline elements at the aqueous alteration on the parent body is expected, we cannot exclude the possibility of the terrestrial weathering by rainwater at this time. Instrumental Neutron Activation Analysis (INAA) is under way for determination of more elemental abundances.

References: [1] Zolensky M. E. et al. (1997) *GCA*, *61*, 5099-5115. [2] Grady M. M.. et al. (1986) *Proc. 11th Symp. Antarc. Meteor.*, 162-178. [3] Clayton R. N. and Mayeda T. K. (1999) *GCA*, *63*, 2089-2104. [4] Kallemeyn G. W. and Wasson J. T. (1981) *GCA*, *45*, 1217-1230.

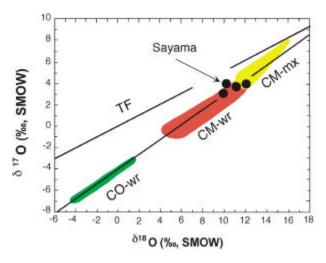


Fig. 3. Oxygen isotopic compositions. Shaded areas for CM whole rock, matrix and CO whole rock are taken from [3]

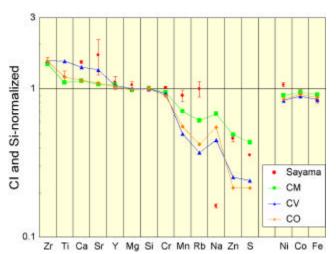


Fig. 4. Major and trace element abundances. Average compositions of CM, CV and CO chondrites are taken from [4]