COUPLING VANADIUM AND BORON ISOTOPES IN CAIs. F. Moynier, P. Sossi, Chizu Kato, M. Chaussidon Institut de Physique du Globe de Paris

After a few decades of dormancy, irradiation models for phenomena in the early Solar System have recently been considered more closely by astrophysicists and cosmochemists on two important grounds. First, the detection of high (relative to solar) and variable X-ray activity in protostars suggests that particle acceleration, and hence irradiation, is a common phenomenon in low-mass protostars [*1*]. X-ray flares accompanied by intense fluxes of accelerated particles have been detected in almost all young stars. X-ray absorption and Fe fluorescent emission line measurements show that X-rays efficiently irradiate protoplanetary disks [*2-4*]. Second, the discovery that the short-lived isotope ^{10}Be ($T_{½}$ = 1.5 Ma) was alive in the early solar system [*5, 6*] has revived the idea that some short-lived radionuclides were produced by irradiation in the early solar system [*7*], since ^{10}Be cannot be produced in stars. However, this interpretation has been challenged by Desch et al. [*8*] who calculated that a fraction of ^{10}Be can also be formed by Galactic Cosmic Rays (GCR) trapped in the presolar nebular cloud. V has one stable isotope (mass 51) and a very long-lived isotope (mass 50, $T_{½}$ = 1.4 x 10^{17} y). The main isotope of V, ^{51}V (99.75 %) is produced through explosive nucleosynthesis [*9*], with a significant contribution from type Ia supernovae [*10*]. The origin of the nuclei ^{50}V is poorly understood. A variety of mechanisms have been considered: p-process [*11*], cosmic-ray spallation origin [*12*] photonuclear nucleosynthesis [*13, 14*], and n-process [(*15*]. Because of the low cosmic abundance (0.25 %) of ^{50}V [*16*], the ratio ^{50}V/^{51}V has long been proposed to be a good tracer of irradiation in an early solar system environment [*17, 18*]. The X-wind model predicts an excess d^{50}V~3 ‰ relative to cosmic composition [*19*]. Therefore, knowledge of the V isotope composition of Solar System material would be a critical test of the irradiation models. Here we will present the V isotopic composition of 7 CAIs measured by MC-ICP-MS at IPG Paris coupled with in-situ determination of the ^{10}Be/^{9}Be initial ratio determined by SIMS (ims1280 at CRPG Nancy). Our preliminary results on 5 CAIs show en enrichment in ^{50}V in the order of magnitude predicted by [19]. By the time of the workshop we will have both V and B data for 10 CAIs.

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OPAQUE MINERALS BEARING FORSTERITE IN CARBONACEOUS CHONDRITES. N. Sakamoto[1], [1]Isotope Imaging Laboratory, Creative Research Institution Sousei, Hokkaido University, Sapporo 001-0021, JAPAN (naoya@ep.sci.hokudai.ac.jp)

Introduction: Amoeboid olivine aggregates (AOAs) are obvious nebular objects having the longest record of nebular condensation and no clear evidence of being molten [1, 2]. The AOAs contain forsterite enriched in ^{16}O and Fe-Ni metal that is a highly sensitive indicator of metamorphism based on the decomposition of martensite [3-5]. Thus, AOAs has a possibility to provide not only the information of whole thermal history in the nebular and parent body but also nebular pressure because the order of condensation of metal and forsterite has a crossover in the vicinity of 10^{-4} bar in a system of solar composition. In this study, opaque minerals enclosed in forsterite were used as a tracer that is one of conceivable basic components of AOAs from several carbonaceous chondrites (Figure 1).

Results and Discussion: Opaque minerals bearing forsterite were found in polished thin sections of Acfer 094 (ung.), Adelaide (ung.), ALHA77307 (CO), Yamato-81020 (CO), Murchison (CM) and Efremovka (CV) carbonaceous chondrites. All forsterite of the objects were enriched in ^{16}O measured by point and imaging isotope analysis using Hokudai isotope microscopes. The forsterite layer has almost constant thickness of about 10 μm and show almost the same crystallographic orientation except for broken part would be chipped on the parent body.

The assemblage of opaque minerals enclosed in forsterite were different depend on the chondrites. In the case of Acfer 094, Fe-Ni metal with 5wt% of Ni is nearly homogeneous suggesting martensite as previously reported [4]. Murchison has mixture of tochilinite and philosilicate inside of the forsterite layer. Yamato-81020 shows the assemblage of kamacite, teanite, magnetite and FeS with dusty texture. These characteristics of opaque minerals enclosed forsterite are consistent with the distribution of Fe among chondrites groups [6] indicating that the martensite bearing forsterite formed in the nebular would be metamorphosed to each assemblage on their parent body.

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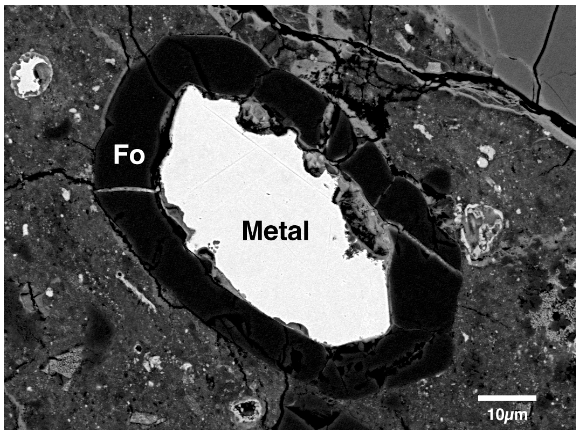

Fig.1 BSE image of metal bearing foresterite in Acfer 094 carbonaceous chondrite.