CV3 CHONDRITES: THREE SUBGROUPS, NOT TWO.

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Introduction. The CV3 chondrites are a petrologically diverse group of meteorites that have been divided into two subgroups (Oxidized and Reduced), based principally on their modal metal/magnetite ratios and the Ni content of the metal and sulfides. However, it was initially recognized that the group is more complicated and Allende differed from the other oxidized CV3 chondrites [1]. Subsequently, the number of CV3 chondrites has increased and the group is currently undergoing considerable scrutiny and reevaluation as to the origin of their secondary minerals [e.g., 2] and other components (our study). One aspect of our study has shown that the compositions of Fe-rich olivine in CV3 chondrite matrices [3] have major compositional trends that suggest subdivision of the oxidized CV3 chondrites into the Oxidized-Allende (OxA) and Oxidized-Bali (OxB) subgroups. It was shown that Allende matrix olivine has a considerably more restricted compositional range than that in Bali. We therefore propose a division of the CV3 chondrites into the $CV3_R$, $CV3_{OxA}$, $CV3_{OxB}$ subgroups. In this report we examine the petrologic and oxygen isotopic characteristics of the three subgroups in order to characterize them and discuss their significance.

Discussion. The meteorites studied include the $CV3_R$ chondrites Arch, Efremovka, Leoville, Vigarano and QUE93429, the $CV3_{OxA}$ chondrites Allende, Axtell, ALH84028 and Tibooburra and the $CV3_{OxB}$ chondrites Bali, Grosnaja, Kaba and Mokoia. However, the discussion below is presented with the caveat that the database is not yet complete for all of above listed meteorites and a comprehensive study of more CV3 chondrites is in progress. **Modally**, the $CV3_R$ chondrites have the lowest matrix abundances with matrix/chondrule ratios of 0.5-0.6, the $CV3_{OxA}$ chondrites are similar, but slightly higher, with ratios of 0.6-0.7, and the $CV3_{OxB}$ chondrites have the highest matrix abundances with ratios ranging from 0.7-1.2 [1,4]. The metal/magnetite ratios are highest in the $CV3_R$ chondrites (2-46), considerably lower in the Allende $CV3_{OxA}$ chondrite (0.2) and lowest in the $CV3_{OxB}$ chondrites (trace metal), but Allende is the only $CV3_{OxA}$ chondrite analyzed thus far. **Fayalitic olivine** in the $CV3_R$ matrix has a limited range of $Fa_{32\text{-}60}$, matrix fayalitic olivine in the $CV3_{OxA}$ chondrites is similar, and the $CV3_{OxB}$ has matrix fayalitic olivine with a wide range of $Fa_{10\text{-}90}$. Additionally, $CV3_{OxB}$ chondrites contain near-pure fayalites (up to 100μm in size) [5] which have not been found in the $CV3_R$ or $CV3_{OxA}$ subgroups. **Metal** in the $CV3_R$ chondrites is mainly low-Ni kamacite, and in the $CV3_{OxA}$ and $CV3_{OxB}$ chondrites it is mainly high-Ni awaruite. However, further work is needed to understand the metal compositions (e.g., we find chondrules in Bali that have kamacite and awaruite). **Hydrous phyllosilicates** are rare in both the $CV3_R$ and $CV3_{OxA}$ chondrites [e.g., 6-9]. However, these phases are more common, although heterogeneously distributed in some cases, in the $CV3_{OxB}$ chondrites [e.g., 10-12]. **Oxygen isotopic compositions** of the CV3 chondrites show a particularly wide range along a slope~1 line. There is complete overlap between the $CV3_R$ and $CV3_{OxA}$ chondrites. While the $CV3_{OxB}$ chondrites also show some overlap with the other CV3 chondrites, most have higher ^{17}O compositions plotting closer to the terrestrial fractionation line (Fig. 1). This may be due, in part, to the more hydrated nature of the $CV3_{OxB}$ chondrites.

Conclusions. The diverse properties of the CV chondrites clearly warrant further examination and the data determined thus far justify their division into three subgroups. The $CV3_{OxA}$ appear to share more similarities with the $CV3_R$ than with the $CV3_{OxB}$ chondrites, and the former two may be more closely related representing a continuum in degrees of oxidizing conditions on the CV parent body or in the CV nebular region. Some of the differing

characteristics of the $CV3_{OxB}$ chondrites may be attributed to parent body alteration, but some of the features suggest that it initially accreted from a somewhat different mix of materials, such as the near-pure fayalites, and possibly had higher abundances of water in the form of ices or primary phyllosilicates.

References. [1] McSween (1977) GCA 41, 1771-1790. [2] Krot et al. (1995) Meteoritics 30, 748-775. [3] Weisberg et al., (1996) Meteoritics 31, A150 [4] Simon et al. (1995) Meteoritics 30, 42-46. [5] Hua and Buseck (1995) GCA 59, 563-578. [6] Tomeoka and Buseck (1982) Nature 299, 327-329. [7] Keller and Buseck (1989) LPSC 20, 512-513. [8] Graham and Lee (1992) LPSC 23, 435-436. [9] Zolensky et al. (1993) GCA 57, 3123-3148. [10] Keller et al. (1994) GCA 58, 5589-5598. [11] Keller and Buseck, (1990) GCA 54, 2113-2120. [12] Tomeoka and Buseck (1990) GCA 54, 1745-1754.

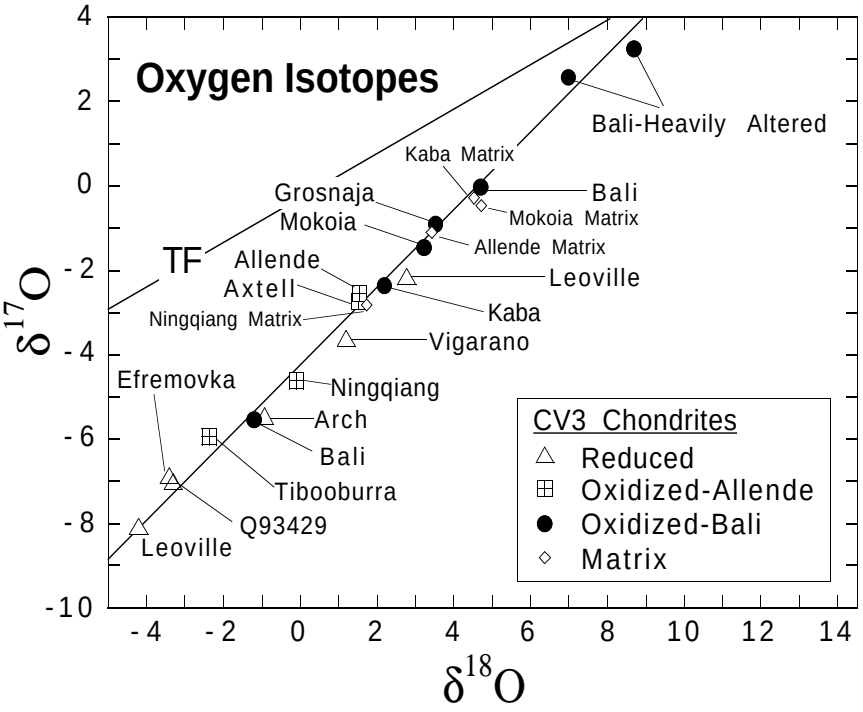

Figure 1. Oxygen 3-isotope diagram showing CV3 whole-rock and matrix compositions. TF is the terrestrial fractionation line.