Cr-BEARING INCLUSIONS IN IVA IRONS: IMPLICATION FOR Cr AND VOLATILE BEHAVIORS IN THE METALLIC CORES. J. Isa[1], K. D. McKeegan[1], and J. T. Wasson[1]. [1]Earth, Planetary, and Space Sciences, University of California, Los Angeles. CA 90095-1567, USA. jisa@ucla.edu.

Introduction: Oxide and sulfide inclusions represent minor and commonly tiny components of iron meteorites but they can be powerful tools to further our understanding of planetary differentiation, and of early solar system history. For example, oxide inclusions have been utilized for deriving relationships between iron meteorites and stony meteorites by mass-independent fractionations [1]. Extending previous studies, we utilized inclusions as a source of information for understanding the elemental and isotopic behaviors during the formation of metallic cores during planetesimal differentiation. We searched for Cr-bearing inclusions in IVA irons in an effort to determine the phases that contribute to bulk Cr concentrations, to understand O behavior, and to determine the O-isotope compositions of asteroidal cores.

Experiments: We selected chips of eleven IVA meteorites that are Cr-enriched (340-655 µg/g) as previously determined by INAA analyses. We also searched four large specimens. Some inclusions were separated by Fe-Ni metal acid digestion. Inclusions were identified from BSE images; the phases were analyzed by using EDX and EPMA. We measured oxygen isotopes on the UCLA 1270 ion microprobe.

Results: We found numerous Cr-bearing sulfide inclusions and chromite inclusions. In previous petrological studies, the occurrence of Cr-sulfide and chromite were observed in several IVA iron meteorites [3]; they were normally associated with troilite. However, observed Cr-sulfide inclusions in this study are often euhedral to subeuhedral and are discrete from other sulfide inclusions. The occurrence of troilite exsolution lamellae with daubréelite ($FeCr_2S_4$) seen in previous studies [3] was only observed in metals with granular texture. Chromite was only found in larger specimens. The O-isotope composition of chromite was ($\Delta^{17}O$=1.0±0.3 ‰ and $\delta^{18}O$=-6.5±0.2 ‰). The $\Delta^{17}O$ value was consistent with those previously measured IVA iron meteorites (1.2‰).

In addition, we discovered a new mineral $MnCr_2S_4$.

Discussion: In previous studies, the negative Cr-Au trend in IVA irons was explained by heterogeneous distributions of chromite grains that are extracted from metallic melt [2]. However, chromite inclusions are very rare in IVA iron meteorites, whereas Cr-bearing sulfide inclusions are relatively common (especially in bulk Cr-enriched samples). This difference is important because the occurrence of primordial chromite or of daubréelite may restrict the ranges of f_{O2} or f_{S2}. Also, this observation explains the presence of elevated Cr concentrations in some irons [2]. The observed Cr-bearing phases changes with bulk Au abundances i.e. progress of metallic core crystallization (Au-poor initial solid: daubréelite and brezinaite; Au-rich evolved solid: daubréelite with troilite and chromite with sulfide). In consequence, we found f_{O2} or f_{S2} changes during crystallization as recorded in inclusions; the liquid metal, parental to the iron meteorites, increased in the oxygen concentration as the core crystallized. The low $\delta^{18}O$ value compared to other IVA oxides may be due to matrix effects although such effects in SIMS are still unclear; further investigation is required. **References:** [1] Clayton and Mayeda 1996 GCA 60, 1999-2017, [2] Wasson 1999 GCA Vol 63 Nr 7/8 1219-1232 [3] Buchwald, 1975 University of California Press.