FORMATION OF IAB-IIICD IRON METEORITES; B.-G. Choi, and J.T. Wasson, Institute of Geophysics and Planetary Physics and Department of Earth and Space Sciences, University of California, Los Angeles, 405 Hilgard, Los Angeles, CA 90024.

Iron meteorite groups IAB and IIICD often contain chondritic inclusions rich in planetary-type rare gas whose presence tends to exclude the possibility of formation in a low-viscosity core of the sort tthat produced the magmatic groups such as IIIAB. Groups IAB and IIICD also differ from other groups in terms of their very high abundances of volatile metals (C, Ga, Ge, As) and in terms of their element-Ni distribution patterns [1]. The compositions of the IAB and IIICD irons differ only in terms of the Ga, Ge and Ir contents of their high-Ni members [1]; no element resolves them at Ni contents < 90 mg/g. We therefore will treat them as a single group in this paper, and use IAB to refer to the combined group. To successfully model IAB, one must explain a large set of unusual properties. The bulk composition of IAB is inferred to be the same as the mean of the low-Ni (Ni < 68 mg/g) members of the group. The O-isotope compositions ($\delta^{18}O \approx 5$, $\Delta^{17}O \sim -0.45$) of IAB silicates fall below the terrestrial fractionation line [2], suggesting a close link to carbonaceous chondrites such as CR or CM. Volatile abundances yield another link of IAB to carbonaceous chondrites; element/Ni ratios in IAB are high, similar to those in CI and CM chondrites, and higher than those in other chondrite groups, carbonaceous chondrites. In this abstract, we suggest that the Ga and Ge depletion in high-Ni IAB irons is related to the high C abundance in this group.

Several ungrouped irons are closely related to IIICD [3] and on some diagrams tend to fill the compositional gap between IAB and IIICD. If we substitute Ir for Ni as the reference axis in log-log plots, they are hardly resolvable. Like IAB members, they show enrichments of Au, As and Cu relative to magmatic irons. Another interesting observation is that on sideophile-Ir plots the IIE iron meteorites, which were produced by impact melting [4], plot with the dense high-Ir head of IAB. The enrichment of melt-favoring elements in IAB, IIICD, IIE and some ungrouped iron meteorites suggests that they originated by partial melting. It has been suggested that such partial melts were produced by impact melting in a megaregolith [1] or the incomplete melting of the interior of a parent body by an certain heat source [5,6]. Both models call for the melt to lie near the Fe,Ni metal-troilite cotectic in order to keep the melting temperature low.

Kracher [5,6] examined a fractional-crystallization model of a partially differentiated chondritic parent body. Assuming that the initial melt contained slightly less S than the cotectic composition, he explained the dense head of low-Ni portion in IAB and IIICD iron meteorites by compositional kinks in siderophile-Ni log-log plots. Cocrystallization of Fe,Ni metal and troilite changes the bulk distribution coefficient dramatically [7]. But one also expects compositional gaps to occur when cocrystallization begins. Troilite doesn't accept most siderophiles into its crystal structure. About four times (by mass) more troilite than metal forms during cotectic crystallization [8]. Because analysts avoid troilite, the concentration of a strongly siderophile element should jump up to a value five times higher. Such compositional gaps are not observed. Also if the IAB melts were nearly identical to the cotectic composition of Fe,Ni metal and troilite, the fraction

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of melt may have been too small to segregate out and form a metallic core, and we do not expect efficient fractional crystallization in small melt pools.

We conclude that IAB siderophile element are better explained by different degrees of melting, plausibly formed by differing melting by impacts [1]. Because such melts have not experienced appreciable intermixing, they preserve more heterogeneous compositions than other iron meteorites formed in molten cores. This model can more easily account for the preservation of chondritic silicate inclusion because of the short duration of melting events. The densely populated low-Ni head head probably reflects almost complete melting. It is interesting and possibly significant that on siderophile-Ir plots IIE compositions are nearly identical to the low-Ni part of IAB.

According to the impact model [1], elements showing low concentrations in IAB remained sequestered in other phases during the impact generation of melt and the collection of these melts into puddles and pools. A problem question is to infer the siting of Ga, Ge and Ir that explains how element/Ni ratios could be 100-1000x lower in high-Ni melts than in the bulk chondrites. We suggest that this requires a strong nebular segregation into the different phases, i.e., the most refractory siderophiles and the most volatile siderophiles must be in phases distinct from the carriers of the common siderophiles. The high content of C and volatile siderophiles in IAB indicates that the precursor chondrite consisted of fine-grained matter that equilibrated with the nebular gas down to relatively low temperatures. In this case the high C content of these precursor materials probably reflects accretion as carbonaceous matter, similar to that in the CM or CI chondrites. We speculate that the Ga and Ge condensed together with this carbonaceous matter, and that it played an important role in sequestering them during the impact production of high-Ni members. This leads to the prediction that bulk C contents should also decrease with increasing Ni. A tentative examination of available data suggests that this may be correct, with bulk C contents dropping from ~20 mg/g at the low-Ni extreme to <0.5 mg/g in the high-Ni members.

Reference: [1] Wasson J.T. et al. (1980) *Zeit. Naturf.*. 35a, 781-795; [2] Clayton R.N. (1983) *EPSL*. 65, 229-232; [3] Malvin D.J. et al. (1984) *GCA*. 48, 785 - 804; [4] Wasson J.T. and Wang J. (1986) *GCA* 50, 725-732; [5] Kracher A. (1982) *Geophys. Res. Lett.*, 412-415; [6] Kracher A. (1985) *PLSC* 15, C689-C698; [7] Kracher A. and Wasson J.T. (1982) *GCA*, 46, 2419 - 2426; [8] Kullerud G. et al.1969, in Magmatic Ore Deposits (ed. H.D.B. Wilson) New Haven.