Appendix A. Supplementary Materials

1. Data Comparison

Comparisons between literature data and this study are provided in Table S1 for Mo. Literature data are generally in good agreement with this study.

2. Fractional Crystallization Modeling

In this study, appropriate solid metal-liquid metal D values (concentration ratios) for the HSE were calculated using the parameterization method developed by Jones and Malvin (1990) and advanced by Chabot et al. (2017):

<mi>

where D_o is the solid metal-liquid metal D value in the light-element-free Fe-Ni system experimentally determined by Chabot et al. (2017). Iron domains are calculated by:

<mi>

where X_S is the mole fraction of S in the metallic liquid, X_P is the mole fraction of P in the metallic liquid, and β_{SP} is a constant specific to the element being parameterized calculated by:

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where β_S and β_P are constants specific to the elements being parameterized experimentally calculated by Chabot et al. (2017). A constant D value for S of 0.001 is used and the D value for P is calculated using Eq. 1.

Liquid HSE concentration (C_L) is calculated by:

<mi>

where F_n is the fraction of liquid and D_n is the partition coefficient of a given element calculated at that fraction of crystallization. Solid HSE concentration (C_S) is calculated by:

<mi>

Equations 1-5 are re-calculated for each increment of crystallization.

3. Tungsten-182 Correction

The IIC group and Wiley average $\mu^{182}W$ values were corrected for nucleosynthetic W isotope variations using the method reported by Kruijer et al. (2014). This was done by using the mean $\mu^{183}W$ value for the IIC group and Wiley and the $^{182/184}W$ *vs.* $^{183/184}W$ (186/184 normalized) isotopic composition obtained for CAIs, which gives a slope value of +1.41 ± 0.06.

4. Thermal Accretion Model

This study uses the thermal accretion model described by Kruijer et al. (2017) and Hilton et al. (2019). In brief, the model uses the IIC group and Wiley's calculated differentiation ages and uncertainties to estimate parent body accretion ages. This model calculates temperature at a depth within a solid sphere that gains heat by ^{26}Al decay. Within the model, temperature is tracked halfway to the center of the body from the surface until it reaches 1600 K, at which point differentiation is assumed to occur instantly. The parent body concentration of Al is assumed to be between 0.86-1.68 wt.%, determined from the range observed in carbonaceous chondrites (Lodders and Fegley, 1998).

Supplementary Tables

Table S1. Comparison between literature Mo isotopic data and the data from this study. Data from the literature were monitored for cosmic ray exposure.

Reference	n	μ^{94}Mo	2σ	μ^{95}Mo	2σ	μ^{97}Mo	2σ

IIC Average								
	Kruijer et al. (2017)[a]	2	227	21	115	14	84	14
	Poole et al. (2017)	3	240	16	161	9	82	5
	Worsham et al. (2019)	4	225	10	156	7	83	7
	This study	3	248	6	156	6	73	10
Wiley Average								
	Kruijer et al. (2017)	8	339	13	219	11	119	11
	Worsham et al. (2019)	3	342	7	223	8	112	7
	This study	2	356	11	230	5	118	2

[a]IIC data were not reported as an average. These values were recalculated from the published data.

Supplementary Figures

Figure S1. Plots of Au (ppm) versus Ga, Ge, and Ir (ppm). Solid lines represent the best fit estimates for S. Gold data for Kumerina determined by laser ablation were below detections limits.

Figure S2a-b. Fractional crystallization model for Re (ppb) versus Re/Os calculated for initial set of parameters defined by 4 wt.% S and 3 wt.% P (Fig. S2a) and 16 wt.% S and 1 wt.% P (Fig. S2b) concentrations. The grey area is the range of chondrites (Walker et al., 2002). The colored diamonds are the data for the IIC irons. The black line represents the solid track and the grey line represents the liquid track. The dashed grey lines show mixing curves connecting the equilibrium

solid and liquid tracks at 5% increments. The black and grey stars represent the first solid and liquid composition to form, respectively. Neither model can account for all IIC irons (Ballinoo in model A and Unter Mässing in model B).

Figure S3a-b. (a) Fractional crystallization model for Pt (ppb) versus Pt/Os calculated for initial S and P concentrations of 8 and 2 wt.%, respectively (Model B in the main text). **(b)** Fractional crystallization model for Re (ppb) versus Ru (ppb) calculated for initial S and P concentrations of 8 and 2 wt.%, respectively (Model B in the main text). In both figures, the black line represents the solid track and the grey line represents the liquid track. The dashed grey lines represent mixing curves connecting the equilibrium solid and liquid tracks at 5% increments. colored diamonds are the data for the IIC irons. The black and grey stars represent the first solid and liquid composition to form, respectively. These fractional crystallization models are in good agreement with the Re (ppb) versus Re/Os model B in the main text. For example, Unter Mässing plots on the solid track in both models, representing a solid crystallization at approximately 26% fractional crystallization.

Figure S4. Thermal model results for Al concentrations of 0.86, 1.20 and 1.68 wt.%. The differentiation age for the IIC group of 3.2 ± 0.7 Myr after CAI formation (black solid line) corresponds to an accretion age of 1.4 ± 0.5 Myr after CAI formation.

Figure S5. Plots of μ^{i}Mo versus μ^{100}Ru for iron meteorites using data from Table 4 and group averages reported by Bermingham et al. (2018), Worsham et al., (2019) and Hilton et al. (2019). NC type meteorites include group averages of IC, IIAB, IIIAB, IIIE, IVA and one ungrouped iron, Gebel Kamil. CC type meteorites include group averages of IID, IIF, IIIF, IVB, SBT, IIC and four ungrouped irons Wiley, Chinga, Dronino, and Tishomingo. The black lines are linear regressions calculated using *ISOPLOT*.

Figure S6. Plot of Ni (wt.%) versus Ga (ppm) using data from this study, Walker et al. (2008), McCoy et al. (2011), Hilton et al. (2019), and numerous studies from the UCLA Wasson group, e.g., Scott et al. (1973), Scott and Wasson (1976), Kracher et al. (1980), and Wasson (1999). Blue symbols are the CC bodies and red symbols are the NC bodies.

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