EXPLORING THE POSSIBLE CONNECTION BETWEEN ORDINARY CHONDRITES AND PRIMITIVE ACHONDRITES.

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Introduction: Primitive achondrites are meteorites with chondritic bulk compositions, but non-chondritic textures [1]. Because their original chondritic textures have been erased, one important issue in the study of these groups is their origin [e.g. 2]. Most primitive achondrite groups have mineral compositions more reduced than ordinary chondrites, but more oxidized than enstatite chondrites [3]. Thus the question has been raised: Are their precursors a type of chondritic meteorite unknown in the world's collections or did these meteorites form by heating ordinary chondrites under reducing conditions? If the latter, this would imply changes during heating and partial melting so altered the primitive achondrites that they are not easily linked to their chondritic precursors. To test these ideas, we compare general properties of reduced primitive achondrites, focusing specifically on the winonaites/IAB group, and H-type ordinary chondrites. We illustrate, using results of heating experiments on ordinary chondrites [4], that initial composition plays a vital role.

Discussion and Implications: The most obvious difference between Win/IAB and H ordinary chondrites (Table 1) is oxidation state. Compositions of olivine, opx, chromite and troilite all point to Win/IAB being more reduced than H chondrites. Recent experiments [4] heated the H-chondrite Kernouvé at temperatures and under oxygen fugacities appropriate to Win/IAB [5]. While olivine and chromite exhibit evidence of reduction under these conditions, opx exhibits no change or a slight increase in Fs value with temperature. In troilite, Cr increases while Fe/S decreases with temperature. The results of the experiments indicate that in order to form the compositions seen in Win/IAB from an H-chondrite precursor, high peak-heating temperatures (in excess of 1200˚C) are required. This is inconsistent with the textures and compositions seen in the Win/IAB. Thus, it appears improbable that Win/IAB formed by heating of a precursor assemblage similar to H chondrites, consistent with marked differences in oxygen isotopic composition [6].

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Table 1. General properties of Win/IAB and H-chondrites.

Mineral		**Win/IAB**	**H-chondrite**
Olivine	Fa (mol%)	1 – 8 [2,5,8]	16.9 – 20.4 [9]
Opx	Fs (mol%)	1 – 8 [2,5,8]	15.7 - 18.1 [9]
Chromite	Cr/Cr+Al	0.9 - 1.0 [7,8]	0.85 [10]
Chromite	Fe/Fe+Mg	0.4 - 0.6 [7,8]	0.85 [10]
Chromite	MgO (wt%)	6-12 [7,8]	2.66 [9]
Troilite	Cr (wt%)	~0.4 [7,8]	BDL*