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HIGHLY VOLATILE ELEMENT TRENDS IN TYPE 3 ORDINARY CHONDRITES Derek W. G. Sears, Karen S. Weeks, R. Kyle Guimon and Bert Calhoun; Department of Chemistry, University of Arkansas, Fayetteville, AR 72701.

Important compositional trends are displayed by the highly volatile elements (HVE; In, Tl, Bi, Pb, C and primordial inert gases) in ordinary chondrites. Certain type 3 chondrites have almost cosmic proportions of these elements, while they are depleted $\sim 10^3$-fold in types 5 and 6. Some authors have argued that their abundance patterns reflect metamorphic-loss, while others argue that their abundance reflects accretion in the nebula and may be used to calculate condensation temperatures. Thermoluminescence sensitivity and other quantitative techniques have shown that the type 3 ordinary chondrites have suffered a wide variety of metamorphic intensities; some chondrites are virtually unmetamorphosed, primitive nebular condensates, while others are little removed from type 4. Zadnick and Anders (G. C. A. in press) recently showed that the relationship between metamorphism and HVE content breaks down within the type 3 ordinary chondrites and have suggested that while some chondrites are most primitive in the sense of least metamorphosed others are most primitive in the sense of containing most HVE. The implications of this suggestion are numerous, one being that it renders a simple relationship between HVE and metamorphism less likely.

Here we argue that, on the basis of existing data, the tendency towards a steady decrease in HVE content as the TL increases (and therefore metamorphism experienced) is still observed if the H and L (+LL) chondrites are considered separately. We suggest that the H and L+LL chondrites differed in their original abundance of HVE; the H chondrite to L chondrite ratios for In, Bi, C, primordial Ar-36, primordial Xe-132 and Tl being approximately 10, 5, 2, 1.5, 1.5 and 1.0, respectively. These differences are much greater than would be expected for siderophile elements on the basis of chemical class.

The difference that we suggest for the primary bulk compositions of the H and L chondrites are either, (1) primary, perhaps reflecting a higher temperature of condensation from the nebula for the L class, or (2) they are secondary, as might be expected if the L chondrites had suffered severe pre-metamorphic shock. The annealing experiments on Tieschitz and Krymka by the Lipschutz group indicate that during shock Tl is lost more readily from the L chondrites than from the H chondrites whereas there is little difference in the retentivity of the other elements by the two groups. On the other hand, the condensation curves for In, Tl and Bi can be used to find conditions in which the observed abundance differences between H and L can be produced. Some scatter in the trends is also to be expected due to misclassification and brecciation, which mixes fragments of diverse history and may redistribute certain trace elements.

In summary, we think it premature to abandon the notion that HVE content varies systematically with metamorphism within the type 3 chondrites. The apparent breakdown in the HVE-metamorphism relationship maybe the result of the H condrites and L chondrites following separate trends which are the result of different starting compositions.