SHOCK EFFECTS IN IIIE IRON METEORITES: IMPLICATIONS FOR PARENT-BODY HISTORY.

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Introduction: The IIIE irons comprise a small C-rich magmatic group (currently with 15 members, all finds) of coarse and medium octahedrites, closely related to group IIIAB. The group was initially identified by Scott et al. [1]; nine samples were described by Buchwald [2]. Distinguishing features of IIIE irons include swollen (sausage-shaped) kamacite bands, as well as haxonite [$(Fe,Ni)_{23}C_6$] (or graphite as a decomposition product of haxonite) within plessite fields. We studied thick sections of 13 IIIE irons: Aliskerovo (Ali), Armanty (Arm), Cachiyuyal (Cac), Colonia Obrera (CO), Coopertown (Coo), Kokstad (Kok), NWA 4704 (4704), Paloduro (Pal), Porto Alegre (PA), Rhine Villa (RV), Staunton (Sta), Tanokami Mountain (TM) and Willow Creek (WC). The two IIIE irons that were not examined in this study, Burlington and Paneth's Iron, were excluded because they were artificially reheated.

Shock Intensity Spectrum: Based on our observations of metal, sulfide and carbon-rich phases, we have sorted these IIIE irons into five categories of increasing shock intensity: weak, moderate, intermediate, strong, and severe.

Weak Shock. Samples (Arm, PA, RV, Sta, TM) have unrecrystallized kamacite grains that contain Neumann bands. Sulfide inclusions consist of polycrystalline troilite with daubréelite lamellae; in many cases sulfide is surrounded by schreibersite. Haxonite occurs within plessite.

Moderate Shock. Samples (CO, Coo) resemble the weakly shocked IIIE irons except that their kamacite grains display the cross-hatched ε-iron structure. One CO sulfide inclusion is associated with chromite.

Intermediate Shock. The only sample is 4704. Widespread recrystallization of kamacite has occurred. Sulfide inclusions resemble those found in weakly and moderately shocked samples, except that in 4704 (a) the sulfide inclusions show evidence of minor melting of troilite and daubréelite, (b) troilite has a jagged interface against kamacite and (c) kamacite occurs inside the sulfide inclusions as scattered 1-7-μm-size irregular grains. Haxonite is partially decomposed to graphite.

Strong Shock. Samples (Cac, Kok, Pal) have recrystallized kamacite and melted troilite. Carlsbergite (CrN) is present as oriented 0.5-1×5-15 μm platelets within Cac kamacite. Haxonite has fully decomposed to graphite.

Severe Shock. Samples (Ali, WC) have sulfide inclusions consisting of euhedral daubréelite crystals, 1-4 vol.% vesicular troilite filaments, and 30-50 vol.% low-Ni kamacite grains, some of which contain 1.5-6.0 wt.% Co. Also present in the inclusions are variable amounts of tetrataenite and schreibersite. Haxonite has fully decomposed to graphite.

Conclusion: The IIIE irons that belong to the more-intense shock categories were exposed to higher pressures and temperatures. The wide range of shock effects in IIIE irons is due to a major impact event on the parent body that affected different group members to different extents as a function of their proximity to the impact point.

References: [1] Scott E. R. D. et al. 1973. *GCA* 37:1957-1983. [2] Buchwald V. F. 1975. *Handbook of iron meteorites*. University of California Press, 1418 pp.