EH AND EL ENSTATITE CHONDRITE PHYSICAL PROPERTIES: NO DIFFERENCE IN IRON CONTENT.

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Introduction: Enstatite chondrites (ECs) are highly reduced meteorites marked by an abundance of enstatite and a depletion or absence of olivine. Of the many attempts to sort these meteorites on the basis of petrography or trace elements, the most widely used system divides the ECs into two groups, EH and EL, based on iron content [1], noting differences between the groups in siderophile trace elements and silicon in the metal.

But do the two groups really differ in iron content? In many cases, the bulk compositions were determined from samples significantly smaller than 10g, while ECs are rich in large clasts and can be heterogeneous at this scale [2].

Grain density and magnetic susceptibility measurements of larger samples can resolve this issue, as they provide a quick and non-destructive measure of average whole-rock iron content.

Results: Using techniques reported previously [3] we have measured density, porosity and magnetic susceptibility of 26 stones from 16 different ECs: 7 EH (4 falls, 3 finds) and 9 EL (5 falls, 4 finds). Grain density grouped between 3.45 and 3.75 g/cm^3, with a few outliers at slightly lower density and one (Khairpur [EL]) with a density of 4.17 g/cm^3. Average grain density for EH is 3.61±0.14 g/cm^3, and for EL is actually slightly higher, at 3.65±0.24 g/cm^3; statistically the two groups are indistinguishable. Considering only falls from the main group, both EH and EL have the same average grain density of 3.64 g/cm^3. Porosities from all but one sample were between 0 and 6.4%.

Most samples had a magnetic susceptibility between a log χ of 5.35 and 5.64, with three having much lower susceptibilities. Average log χ for EH is 5.21±0.46 and for EL is 5.38±0.30. Eliminating outliers, average log χ's for EH and EL agree at 5.45.

Discussion: The EH and EL chondrites are indistinguishable in all of the physical properties tested: density, porosity, and magnetic susceptibility. We conclude that there is no systematic difference in iron content between EH and EL chondrites.

Still, it is apparent that individual ECs show clear mineralogical differences that cannot be explained by metamorphism; indeed there may be multiple EC parent bodies [4]. A re-examination of these important meteorites with modern analytical tools, cognizant of their large heterogeneities, should allow a better understanding of trace element trends and their origins.

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