

Physical properties of the Chelyabinsk meteorite fragments

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Abstract

Bulk and grain density, porosity, and magnetic susceptibility of 44 Chelyabinsk (LL5) meteorite fragments have been measured. The meteorites included both bright and dark (shock darkened) lithology and their masses were in range of 1.2 g to 300 g.

Mean bulk (3.29 g/cm^3) and grain (3.47 g/cm^3) density and porosity (6%) matches LL fall range reported in [1] and does not differ between bright and dark lithology. The mean magnetic susceptibility (logarithm of mass susceptibility in $10^{-9} \text{ m}^3/\text{kg}$) of the bright (4.50 s.d. 0.07) and dark (4.57 s.d. 0.13) is, however, in-between mean values reported for L (4.87) and LL (4.10) falls in [2]. This suggests that the amount of metallic iron is in the intermediate L/LL range and higher than in typical LL chondrites. The dark lithology has slightly higher magnetic susceptibility compared to bright one, but the difference is still within standard deviation (s.d.) and thus, susceptibility cannot be used to distinguish between these two lithologies.

All above mentioned parameters are consistent through whole mass range and do not differ significantly among bright and dark lithology and brecciated samples with significant amount of impact melt. This suggests that the Chelyabinsk meteorite parent body was rather homogenous in its composition despite its brecciated nature and complex shock history.

References

Rochette P. et al. (2003) *Meteoritics & Planet. Sci.*, 38, 251-268.

[2] Consolmagno G. et al. (2008) *Chemie der Erde*, 68, 1-29.

