

THE GHUBARA L5 BRECCIA AND ITS REGOLITH MATURITY.

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The Ghubara meteorite was found in the deserts of Oman in 1954 and described as a 226-kg black L5 chondrite with "unequilibrated host" (Fa_{22-27}) and "equilibrated xenoliths" (Fa_{24}) [1]. The meteorite is gas-rich [2], and it is clear that Ghubara is a regolith breccia with dark matrix and light clasts. Haq et al. [3] previously showed that induced thermoluminescence (TL) measurements can provide an estimate of the maturity of regolith breccias, so we measured the induced TL properties of eight matrix samples and nine samples of light clasts from Ghubara. The samples were taken from three cores and were supplied to us by M. E. Lipschutz.

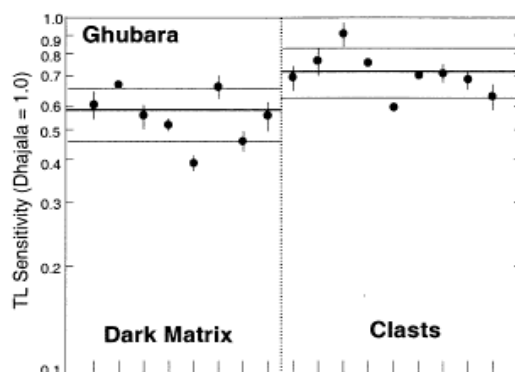


Fig. 1. TL sensitivity values (Dhajala normalized) for matrix and clast samples of the Ghubara regolith breccia.

Our TL sensitivity data are shown in Fig. 1. While there is a certain amount of overlap, the matrix samples have lower TL sensitivity than the clast samples (means $\pm 1 \sigma$ are 0.53 ± 0.09 and 0.7 ± 0.1 , respectively), with the averages giving a matrix/clast ratio of 0.76. The matrix-to-clast TL sensitivity ratio for ordinary chondrite regolith breccias varies from 1.0 to 0.1 in a log-linear fashion with increasing regolith maturity when compared with other indexes of maturity (volatile-trace-element and C abundances). Thus a value of 0.76 indicates a moderate degree of maturity. Also consistent with moderate maturity, the induced TL peak temperature and peak width data for the clasts and matrix are similar, whereas for mature regoliths the matrix tends to have broader peaks at lower peak temperatures compared with the clasts.

While solar-trapped gas abundance and C content increase with regolith maturity, in the case of a find like Ghubara the data can be compromised by weathering, which causes the loss of trapped gases, the trapping of atmospheric gases [4], and contamination with terrestrial C. The ratio of TL sensitivity values for the matrix and clasts is independent of weathering. The ^{20}Ne , ^{36}Ar , and C contents of Ghubara are consistent with a moderate degree of maturity, in agreement with the induced TL data, but ^4He data suggest a highly immature regolith. However, literature values for ^4He are in poor agreement, and this light inert gas is especially prone to redistribution during weathering. We suggest that Ghubara is a regolith breccia of moderate maturity, comparable to St. Mesmin and less mature than Leighton (TL sensitivity matrix/clast ratios of 0.63 and 0.28, respectively).

References: [1] Binns R. A. (1968) *GCA*, 32, 299–317. [2] Schultz L. and Kruse H. (1989) *Meteoritics*, 24, 155–172. [3] Haq M. et al. (1989) *GCA*, 53, 1435–1440. [4] Scherer P. et al. (1994) in *Noble Gas Geochemistry and Cosmochemistry* (J. Matsuda, ed.), pp. 43–53.