THE METALLIC IRON CONTENT OF BRECCIA 14313, Dave J. Dunlop, Dept. of Physics at Erindale College, Univ. of Toronto, Toronto, Ont. Canada

A detailed study has been made of the viscous remanence (VRM) and thermoremanence (TRM) of lunar breccia 14313 in an effort to clarify the origin and nature of primary and secondary natural remanences (NRM) in lunar soil and low metamorphic grade breccias. For acquisition times t_a = 8 min to 24 hrs and decay times t_d which do not exceed a particular t_a the VRM of 14313 increases linearly with log t_a and decays linearly with log t_d at identical rates. For times greater than t_a, Richter-type decay is observed because the upper limits of the relaxation time spectrum activated by the VRM has been exceeded. The partial TRM spectrum has an unusually large fraction of very low blocking temperatures, explaining why 14313 (and other type 2 lunar breccias) have anomalously high magnetic viscosity. The hardness (or resistance to AF demagnetization) of the higher temperature partial TRM, which constitutes the most stable fraction of NRM, increases in the normal way with increasing blocking temperature. Partial TRM acquired above 700°C are unaffected by AF of 1000 oersted. Low temperature partial TRM indicate two populations of iron grains, one having coercivities below 300 oersted, the other having coercivities largely above 600 oersted. The grain size-shape distribution derived from partial TRM data shows that the hard component is carried by very small (<100Å) elogated particles with microscopic coercive forces H_{co} of 2000 - 10,000 oersteds. The softer component has a relatively constant distribution with respect to H_{co} with a lower cutoff at 200 - 300 oersted (the crystalline anisotropy limit in equant particles) and an upper cutoff about 1500 oersted. With respect to grain size, the distribution is concentrated below 200 angstrom and, in accord with hysteresis data, peaks in the superparamagnetic range below 100 angstroms. The number of grains varies as $v^{-1.8}$, where v is volume, in good agreement with the v^{-2} dependence found by Stephenson (1971) for an Apollo 11 soil. We conclude that the primary NRM is extremely hard. The secondary component is probably a VRM part of which is rather soft and eliminated by AF of 150 to 200 oersted and part of which is extremely hard and only slightly affected by AF of 1000 oersted.

Reference:

Stephenson A. (1971) Phys. Earth Planet Interiors 4, 353-369