MAGNETIC PROPERTIES OF APOLLO 16 and 17 ROCKS - INTERIM REPORT.

S.K.Runcorn, D.W.Collinson and A.Stephenson, Department of Geophysics and Planetary Physics, School of Physics, University of Newcastle upon Tyne, Newcastle upon Tyne NE1 7RU England.

Apollo 16 samples.

An anorthosite sample, 60015,49 is characterised by very weak initial susceptibility and natural remanent magnetization (NRM) of $< 2 \times 10^{-6}$ emu.g^{-1} Oe^{-1} and 1.1×10^{-6} emu.g^{-1} respectively. In an alternating field of 90 peak Oe the NRM was reduced to 2×10^{-6} emu.g^{-1} without significant change of direction. The saturation isothermal remanent magnetization (IRM) was, as expected, also very low at 8×10^{-4} emu.g . There is clearly very little iron in this sample.

Sample 67915,47 (breccia), with initial NRM intensity of 3.2×10^{-6} emu.g^{-1}, showed substantial variations in intensity during A.F. demagnetization with a suggestion of a stable direction between 15 and 300 Oe. In higher fields more scatter was apparent with poor repeatability at the same demagnetizing field. Another chip, 67915,49 became too weak to measure after demagnetization in 30 Oe from an initial NRM of 3.2×10^{-6} emu.g^{-1}. The initial susceptibility of these two chips was 59.0×10^{-6} and 19.2×10^{-6} emu.g^{-1}.Oe^{-1}.

Another chip of 67915,49 showed a saturation IRM of 8.6×10^{-3} emu.g^{-1} which was reduced to 1.9×10^{-3} emu.g^{-1} in a demagnetizing field of 500 Oe; this is evidence for the presence of iron grains in the rock which are capable of retaining a hard remanent magnetization. Experiments carried out to investigate the acquisition of thermoremanent magnetization in 67915,47 were unsuccessful because of chemical changes occurring below 500° C.

Another breccia sample, 64475,7 had a much stronger initial NRM of 72×10^{-6} emu.g^{-1}. This was reduced to about 0.7×10^{-6} emu.g^{-1} after demagnetization in 165 Oe with a change of NRM direction of about 30° ; intensity and direction then remained approximately constant up to 300 Oe, after which good repeatability at the same demagnetizing field was not observed.

Although sample 64475,7 may have had a fairly simple magnetization history, that of 60015 and 67915 is

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less clear. By demagnetization of the saturation IRM, the anorthosite sample can also be shown to contain grains which are capable of retaining a very hard magnetization, yet they do not appear to be contributing to the observed remanence, as is also the case with 67915.

Apollo 17 samples.

Three basaltic samples have been received to date, 70017,78, 70215,45 and 76315,42. Their NRM intensities are 51.5 x 10^{-6}, 6.6 x 10^{-6} and 6.8 x 10^{-6} emu.g respectively.

On A.F. demagnetization, a chip of 70017,78 decreased in intensity to about 1.0 x 10^{-6} emu.g^{-1} in 75 Oe, with a change of direction of about 60°, most of which occurred between 0 and 15 Oe; this suggests the presence of a soft component of magnetization acquired in the field in the spacecraft during the mission (1). Between 100 and 300 Oe the intensity recovered to about 3.0 x 10^{-6} emu.g^{-1} with approximately constant direction, indicating the presence of a stable component of NRM. The dip in the intensity curve during A.F. demagnetization has been noted in several Apollo samples. On thermal demagnetization, another chip of 70017,78 became unstable at 260°C and consistent results could not be obtained at higher temperatures.

The initial susceptibility of this sample was 147 x 10^{-6} emu.g^{-1}.Oe^{-1}; saturation IRM was acquired in 2000 Oe, its magnitude being 1.9 x 10^{-3}emu.g^{-1}. No significant time decay of the saturated IRM was observed.

References.

(1) G.W.Pearce and D.W.Strangway, Cause of Secondary Magnetization in Lunar Samples. Apollo 16 Preliminary Science Report, NASA Manned Spacecraft Center, 1972