Magnetic properties of the lunar sample 67559,15 and chemical demagnetization
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Experiments: 67559,15 is a relatively coarse-grained basaltic melt sample similar to 68415. Sample 67559,15 was sawed into three subsamples, which were used for paleomagnetic studies. Another small chip was used for measurements of hysteresis parameters (saturation magnetization Js; saturation remanence Jr; coercive force Hc; and remanence coercive force Hrc) and for thermomagnetic analysis with a vibrating sample magnetometer.

Hysteresis parameters and Js(T): Js=0.465 emu/g, Jr/Js= 0.0082, Hc=21.8 Oe and Hrc=300 Oe were obtained. The relatively small values of Hc and Jr/Js are in accordance with the coarse-grained nature of the rock. According to thermomagnetic analysis, the magnetic phases are mainly kamacite with Ni= 7%. Ni free iron was also observed.

Natural remanent magnetization: NRM intensities of 3 subsamples are 1.86X10^-5, 0.59X10^-5 and 3.87X10^-5 emu/g. NRM directions and their changes during demagnetization processes are shown in Fig. 1. The initial NRM direction is not well grouped. Sawing the sample might have disturbed the NRM.

Subsample No.1 was demagnetized with alternating fields (AF). The NRM direction changed erratically. The NRM intensity decreased to 10% of the initial value of 60 Oe. Compared with the demagnetization curve of ARM which was induced in a small dc field, the NRM is obviously less stable. (Fig.2). The NRM subsample No.2 was thermally demagnetized (Fig.3). The NRM direction was stable up to 200 C, but after that it became incoherent.
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Since sawing was suspected to have produced artificial unstable remanence, subsample No.3 was chemically demagnetized with dilute acid. It was found that chemical demagnetization was very effective (Fig.4). The directional change was initially rather erratic, but subsequently the direction approached an apparently stable direction. After 40 days of chemical demagnetization, the remaining remanence (0.6% of the initial remanence) was AF demagnetized (Figs 5 and 1). Although there are some unstable components,

both directional and intensity stability of NRM have greatly improved compared with subsample No.1. Subsequent thermal demagnetization was rather noisy but the existence of stable high temperature remanence was inferred. Paleointensity estimates with Thellier's method were attempted (Figs.6 and 1) without success. Partial TRM increased with increasing temperature in the temperature range 25-500 °C, where NRM intensity did not change much. (This could be due to the effect of the previous AF demagnetization). To establish a chemical demagnetization procedure for future use, a leaching experiment was done on subsample No.1. The intensity of saturation remanence Jrs and the intensity Jrs(200) of the JRS after AF demagnetizing at 200 Oe were measured in the course of acid leaching (Fig.7). The increase of Jrs(200)/Jrs with time indicates that larger (2) and presumably softer grains are dissolved quickly leaving behind fine grains. These grains are probably protected within silicate grains as described by Gose et al (1973)(2). It is also similar

to the finding by (1) in the case of chondrite leaching experiments.

In summary, the NRM in 67559 seems to be too soft to recover reliable paleomagnetic information. Chemical demagnetization seems to be useful to get rid of unstable components of NRM.

References.