

THERMOGRAVIMETRIC AND X-RAY DIFFRACTION ANALYSES OF LUNA-24 REGOLITH SAMPLES

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Two samples of Luna-24 were analysed by X-ray Diffraction and thermogravimetric (TG) techniques. The sample 24123.12 shows a weight loss of nearly 0.85 per cent between 230–440 °C and followed by 1.16 per cent weight gain from 500 to 800 °C. The sample 24190.13 showed only a weight gain of about 1.5 per cent from 500 °C to 900 °C. X-ray diffraction analyses show the presence of olivine, plagioclase, pigeonite, enstatite, and native iron in both the virgin samples. The heated samples, however, show that only the native iron got oxidized to iron oxide. The other constituents remain unaltered.

INTRODUCTION

IN continuation of the thermogravimetric (TG) and X-ray diffraction analyses of Luna-16 and Luna-20 regolith samples reported earlier (Deshpande *et al.*, 1974), similar studies of the Luna-24 samples collected from *Mare Crisium* were undertaken. Two samples 24123.12 and 24190.13 were made available in small quantities for thermogravimetric and X-ray diffraction studies.

Basu *et al.* (1977) have reported the petrology, mineralogy of Luna-24 drill core soils. They report the monomineralic fragments of pyroxene, plagioclase and olivines. Friel and Goldstein (1977) have reported metal particles in Luna-24 soil.

Loss of gases in vacuum and oxidation in air of Apollo-16 soils have been reported from thermogravimetric analysis (Gibbson & Moore, 1972; Hanneman, 1970; Herr *et al.*, 1970).

X-ray powder diffraction of Luna-24 samples was undertaken as an attempt to identify various crystalline components present in the bulk, i.e., without any separation. TG was carried out with a view to atleast roughly estimate the presence of any decomposable or oxidizable matter in the soil.

EXPERIMENTAL

The microthermobalance employed in the present study has already been described earlier (Dharwadkar *et al.*, 1975). The TG curves were recorded at 5 µg sensitivity on only ~ 5 mg samples in flowing air (at 2.5 l/hr flow) at the heating rate of 10°/min. *X-ray Diffraction Analysis* : The samples were filled in 0.3 mm diam. quartz capillaries and were mounted on philips Debye Scherrer powder camera. Photographs were recorded using nickel filtered Cu $k\alpha$ radiation. An exposure of 4 hrs was found to be suitable. Film shrinkage correction was applied to the data recorded.

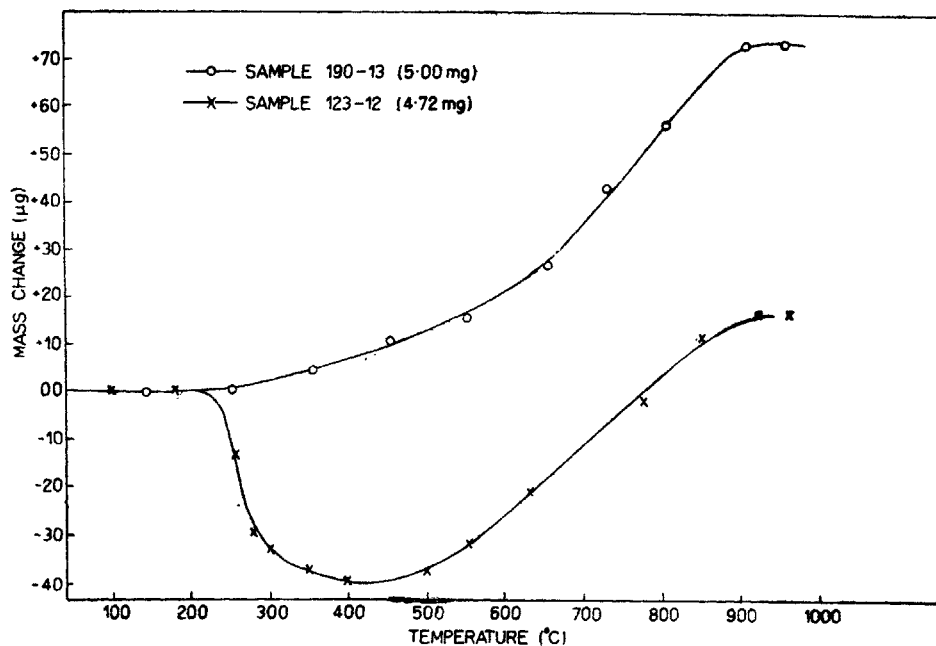


FIG. 1. TG : Runs of samples 24123 and 24190.

RESULTS AND DISCUSSIONS

TG : TG runs of 24123 and 24190 were taken in air up to 1000 °C and are shown in the Fig. 1. In case of the sample 24123.12 it was observed that there is a weight loss of 0.85 per cent in the temperature range of 230 to 440 °C and a weight gain of 1.16 per cent from 500° to 800 °C. In the case of 24190.13 however there was only a weight gain of 1.5 per cent from 500 to 900 °C. The loss of weight could not be accounted for as there does not seem to be any decomposable matter in these samples. It is possible that the sample might have accidentally picked up some moisture during the process of handling. This water held on silicious matter can be expelled only at a higher temperature at least above 200 °C. The weight gain can be explained on the basis of the oxidation of free Fe to Fe_2O_3 .

X-RAY DIFFRACTION ANALYSIS

As it was pointed out in our earlier work on Luna-16 and Luna-20, the virgin samples contained free iron characterised by peaks at 2.029, 1.758 and 1.485 Å and the TG residue showed that these peaks weakened and new peaks characteristic of Fe_2O_3 i.e., 2.69, 1.84 and 1.69 Å appeared. This indicates that, the iron present in the virgin sample got oxidized on account of the heating of the sample in air in the thermogravimetric studies.

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