FLUOROMETRIC EXAMINATION OF APOLLO 15 LUNAR SAMPLE CONTAMINATED WITH LM EXHAUST PRODUCTS. J. H. Rho and A. J. Bauman, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, 91103.

The LM exhaust-contaminated sample (15013) was collected in a Special Environment Sample Container (SESC) from the lunar surface in an area disturbed by the DFS engine just north of the LM. The SESG was opened in an atmosphere of dry helium (1).

Approximately 8 grams of 15013, 1 was Soxhlet extracted with benzene-methanol 3:2 v/v in an argon atmosphere as described previously (2) and about an equal portion of the same sample was similarly extracted in air. The extracts were concentrated to a volume of 0.5 ml under identical conditions and examined fluorometrically. The extract obtained in air yielded no fluorescence appreciably above that of a blank but that from the argon atmosphere revealed the presence of a compound which not only exhibited absorption peaks at 320 and 425 nm but which also fluoresced at 660 and 725 nm with a maximal excitation of 425 nm. Its absorption spectrum and double emission peaks were similar to those of porphyrins except that its emission maximum was shifted about 50 nm toward the far red region relative to that of known porphyrins. A highly conjugated molecule such as phthalocyanine has an emission peak in this region but its spectrum is not identical to that of the lunar sample extract. Partition of the lunar compound between 6N HCl and benzene left it in the benzene phase. This behavior is in disagreement with the findings of Hodgson, et al, who described the selective partition of porphyrin-like compounds into polar solvents.

Because the surface fines sample examined in this study was probably contaminated by the LM descent-engine exhaust, it is difficult to determine if it is indigenous without comparison with samples collected at other sites. The unknown fluorescent compound is present in the lunar sample at a concentration of about a part per billion. A more accurate estimation of its concentration must await calibration work with known samples. Characterization of the exact chemical nature of the compound, therefore, will require much larger samples.

If the compound is indigenous an understanding of its nature would be immensely important from the standpoint of chemical evolution. If it is an artifact of the LM descent engine future mission samples may be seriously contaminated and the possibility of its general spread to other sites is obvious. The samples from several different collection sites should therefore be examined by fluorescence spectroscopy in order to determine this.

The mass spectrometric analysis of the same sample by Simoneit et al (5) indicated that the concentration of the nitorgenous compounds attributable to the LM exhaust was in the range of 2 ppm. All nitorgenous species found were also present in the experimental LM exhaust analysis (6, 8). Although Simoneit et al (5) were unable to detect any complex nitorgenous
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Compounds in the Apollo 15 surface fines N₄ porphyrin-like substances were
detected in the experimental LM exhaust products (7). A discrepancy in
the detection of porphyrin-like compounds in the LM exhaust contaminated
sample between the two different methods may well reflect a rather sig-
nificant difference between the two instrumental sensitivities.

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