Introduction

This symposium was organized to provide an opportunity for those outside of the National Aeronautics and Space Administration lunar sample program to learn of some of the advances in methods and instrumentation resulting directly from the program. The papers included in these proceedings include two additional papers as well as eight papers presented at the symposium. The two papers were added in an attempt to broaden the coverage of the proceedings to include a more representative sampling of the many analytical techniques developed for lunar sample analysis. These proceedings still do not deal with all disciplines represented in the lunar sample program, but the methods covered appear to offer the greatest potential application to the analysis problems of many ASTM chemists.

The papers describe the present status of advanced testing methods used in lunar sample analysis. Particular emphasis is placed on the description and evaluation of the various experimental techniques as opposed to other lunar science conferences which have emphasized interpretation of the results. Since contamination control is such a vital consideration in lunar sample work, several papers are presented dealing with that aspect. Particulate and organic contamination control procedures and monitoring techniques developed for the Lunar Receiving Laboratory sample processing cabinets and individual principal investigators' installations are described. These techniques should have applications to problems of contamination control in the electronics manufacturing industry, the assembly of equipment for use in space, and many other situations where ultraclean particulate and organic contamination levels are required. Two of the papers deal with the analysis of trace volatiles in rocks released by heating and would seem to be candidate methods for the analysis of dissolved gases in metals and alloys. A microsampling technique for infrared vibrational spectroscopic analysis is described which allows one to obtain molecular structure information on isolated single 1200-150 μm mineral grains and on grains in situ in polished rocks. This technique should have application in material testing when only very small samples are available or for in situ studies of impurities or contaminants which degrade the properties of the parent material. Another technique utilizes polarized crystal-field spectra to obtain information on oxidation states of the trace elements iron, titanium, and chromium in silicate rocks. A similar technique may be useful in the study of ceramics or other related materials. One study examines the luminescence properties of lunar
samples to establish the extent to which rocks and minerals can be identified by luminescent spectra. Other methods of analysis described include scanning electron microscopy and neutron activation analysis. The potential application of these techniques to analytical problems in materials testing is certainly considerable, and many more possibilities beyond those briefly mentioned here will be recognized by those reading these proceedings.

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