May 1967

Brief 67-10138

# NASA TECH BRIEF



## Status of Ultrachemical Analysis for Semiconductors

The range of topics which have a pertinency to ultrachemical analysis for semiconductor materials is fantastic. It embraces major portions of physics and chemistry and research has been reported recently ranging from wet-chemical determination of stoichiometry for selenides and tellurides to electrical measurements for pure materials.

As a consequence, a project was initiated to determine the status of ultratrace chemical analyses of materials of interest to the field of semiconductors.

Three areas were selected for a more intensified study and the results of this study are contained in: "The Status of Ultrachemical Analysis for Semiconductors," by Robert V. Dilts and Larry C. Hall, Final Report, Vanderbilt University, December 15, 1966.

*Part I, Atomic Absorption Spectroscopy,* is the method of choice for the bulk analysis of metal ions present in the parts per million (ppm) range, or less, in solutions. Over 60 different metals are capable of determination by this technique, with detection limits and sensitivities that are, in general, excellent. Forty-eight elements can be detected at a level of one ppm or less and 17 more can be detected at concentrations above one ppm in solution.

*Part II, Emission Spectroscopy* has long been used as a method for the determination of small amounts of elements in a wide variety of materials. The method is capable of determining impurities down to the trace, parts per million, range routinely and with favorable circumstances down to the ultratrace, parts per billion, level.

*Part III, Activation Analyses* are concerned with the methods of inducing nuclear transformations by subjecting nuclei to neutrons, protons, deuterons, alpha particles, and $He^3$ ions. At present, neutron activation is viewed as the most general, sensitive method for elemental detection. It serves as a comparison for other trace and ultratrace methods.

The report also makes recommendations that should offer profitable areas to improve sensitivity, reliability and versatility for ultratrace chemical analyses.

**Note:**

Copies of this report are available from:
Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10138

**Patent status:**

No patent action is contemplated by NASA.

Source: R. V. Dilts and L. C. Hall
of Vanderbilt University
under contract to
Marshall Space Flight Center
(M-FS-2254)

Category 03