NASA TECH BRIEF

Trace Levels of Metallic Corrosion Determined by Emission Spectrography

The problem:

To develop a method for determining trace amounts of inorganic impurities in potable water at levels as low as 0.1 part per million (ppm). The selected metals were aluminum, beryllium, calcium, chromium, copper, iron, magnesium, manganese, molybdenum, nickel, lead, titanium, and zinc. Conventional methods of water sample preparation for emission spectrographic analysis provide contaminant determinations at >100 ppm. To lower this level to 0.1 ppm would require boiling down a minimum of 10 liters of water to obtain the necessary solids to permit analysis. This is costly in both time and equipment and requires extremely critical sample handling techniques.

The solution:

Dilute a sample of potable water with Li_2SO_4 matrix solution and add a palladium solution ($PdCl_2$) as an internal standard. Evaporate the sample to dryness and prepare an emission spectrographic film.

How it's done:

The water sample is mixed equally with Li_2SO_4 matrix solution, the $PdCl_2$ internal standard solution is added, and the total mixture is boiled down at 150°C. An emission spectrographic film is made, using a portion of the residual solids from this solution. A "known" sample is prepared, containing the suspected contaminants in controlled quantity, and processed in identical fashion. Comparison of the two film records, supplemented by the film calibration values, permits determination of the presence and level (± 10 percent) of contaminants in the unknown sample. Accuracy of results using this method is dependent on competent preparation of the known sample and consistency in the processing of the photographic film. The number of contaminants to be determined by one analysis is established by the preparation of the known sample. By substituting other materials for the matrix and internal standard solutions, a large number of additional substances may be included in the above list of contaminants.

Notes:

1. This method should be of interest to plant biologists, chemists working in organic synthesis, and pathologists.
2. A detailed description of the basic method is contained in a technical paper, "Spectrochemical Method for Silver," Journal of American Water Works Association, February 1963, by George A. Uman, p. 205–208.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   Houston, Texas 77058
   Reference: B66-10701

Patent status:

No patent action is contemplated by NASA.

Source: H. H. Snell
of North American Aviation, Inc.
under contract to
Manned Spacecraft Center
(MSC-1193)

Category 03