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This Week's Citation Classic

Hatch W R & Ott W L. Determination of sub-microgram quantities of mercury by atomic absorption spectrophotometry. *Anal. Chem.* 40:2085-7, 1968.
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An accurate and sensitive procedure is presented for the determination of mercury in various sample types including water and biological materials. The adaptation of a commercial atomic absorption spectrophotometer (AAS) with a quartz windowed mercury vapour cell enabled the analyst to readily apply the procedure to a variety of sample types. [The *SCI*® indicates that this paper has been cited in over 540 publications since 1968.]

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"In late-1964, we were engaged in the analysis of rock samples as part of an exploration program which used the mercury halo method as a guide to base metal mineralization. Portable mercury instruments were used in the field, but were subject to various interferences. Our analytical work was directed at analysing and providing secondary rock standards for field use. Mercury analysis was carried out using the sensitive, but demanding and time-consuming, dithizone spectrophotometric procedure.

"The laboratory purchased its first atomic absorption spectrophotometer (AAS) in 1965. Repeated attempts to determine mercury in rocks at the ppm level using the standard flame method were unsuccessful due to the poor sensitivity in the flame. During our investigations it was noted that merely opening a bottle of mercury near the AAS resulted in complete deflection of the absorbance null meter when set at the 253.7 nm mercury line. Simple calculations indicated that the mercury levels in the air at ambient temperatures were extremely low. It was also apparent that the mercury concentration in the air was of the same magnitude as that which could be produced if the mercury in the sample was vaporized as elemental mercury.

"A quartz windowed cell was constructed which proved suitable for containing mercury in the light path. We were familiar with the aeration procedure of Kimura and Miller[1] and after some modification of the system and elimination of water vapour in the gas phase, a procedure was developed for reducing and aerating mercury from aqueous solutions and pumping the vapour into the cell mounted on the AAS. Providing the sample could be taken into solution by an oxidative attack, the mercury could be subsequently released and determined. The procedure was applied with considerable success to various types of rock, ores, and organic-containing materials.

"Several reasons for the wide acceptance of this method are: (1) The method was extremely sensitive and allowed the determination of mercury at the ppb level in various organic materials. (2) The concern for the environment and health risks due to mercury ingestion had only recently been realized and there was great interest in determining organic and inorganic mercury in various foods and other plant and animal samples. (3) The procedure did not require expensive apparatus or instrumentation but could be adapted to commercial atomic absorption units which were common in most laboratories.

"The method was adopted by the American Society for Testing and Materials as a 'Standard Test Method for Total Mercury in Water'[2] in 1979, and approved prior to that by the US Environmental Protection Agency and the American Public Health Association.

"Various modifications have been made and the method has been adapted to the determination of organic and inorganic mercury in water and biological samples. A review published in 1975 covers the literature on non-flame atomic absorption."[3]

1. **Kimura Y & Miller V L.** Mercury determination at the microgram level by a reduction-aeration method of concentration. *Anal. Chim. Acta* 27:325-31, 1962.
2. Standard test method for total mercury in water. *1980 annual book of ASTM standards. Part 31. Water.* Philadelphia: American Society for Testing and Materials, 1980. Designation D 3223-79. p. 476-82.
3. **Uno A M.** The determination of mercury by non-flame atomic absorption and fluorescence spectrometry: a review. *Anal. Chim. Acta* 76:1-26, 1975.