

National Bureau of Standards

Certificate of Analysis

Standard Reference Materials

1086, 1087, and 1088

Hydrogen in Unalloyed Titanium

Analytical Program Performed at the Albany Research Center,
U.S. Bureau of Mines, Albany, Oregon, by
A. J. Mackie

These materials are in the form of small chips (~500/g), intended for calibration of hot-extraction and vacuum-fusion apparatus used in the determination of hydrogen.

NOTE: For most types of apparatus, the chips will require pelletizing or encapsulating in the user laboratories for satisfactory application of the standards.

CAUTION: The bottle should be kept tightly closed except when in direct use.

SRM No.	1086	1087	1088
	Parts per million by weight ($\mu\text{g/g}$)		
Hydrogen value ^a	116	57.5	88.5
Estimated uncertainty ^b	3	2.5	2.5

^aThe hydrogen value listed is the *present best estimate* of the "true" value. (Determinations were made on pellet samples.)

^bThe estimated uncertainty listed is based on judgment and represents an evaluation of the combined effects of method imprecision and material variability for samples of 0.2 g (or more).

The analytical work was performed at the Albany Research Center, U.S. Bureau of Mines, Albany, Ore., by A. J. Mackie and D. H. Bollman, as part of a larger cooperative program with NBS in the determination of gases in metals.

The technical and support aspects involved with these Standard Reference Materials were coordinated through the Office of Standard Reference Materials by R. E. Michaelis.

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George A. Uriano, Chief
Office of Standard Reference Materials

PLANNING, PREPARATION, TESTING, ANALYSIS: The base materials for SRM's 1086 through 1088 were supplied to NBS during the 1960's in an Industry-Government program for the preparation of composition standards for titanium and titanium-base alloys. They were supplied in the form of rods 32mm in diameter. In this form, the three unalloyed titanium materials were tested and were found not to be sufficiently homogeneous to be issued as SRM's. In the mid-1970's, NBS, in response to a need from ASTM Committee E-2 on Emission Spectroscopy, milled lots from the rod materials that were blended for SRM's 650 through 652.

Test samples of the milled materials sent to the Albany Research Center of the U.S. Bureau of Mines in 1978, showed the materials to be homogeneous and to contain the important concentration range for hydrogen in titanium. Sub lots of each batch of millings were selected, placed in five bulk containers, and designated SRM's 1086 through 1088, Unalloyed Titanium for Hydrogen, to be issued in the form of millings.

Hydrogen determinations were made by hot extraction of the hydrogen into a vacuum, followed by measurement of the pressure of the evolved hydrogen. The titanium millings, as received, were pelletized with a hand press. The pellets weighed from 0.19 to 0.36 grams. NOTE: Tin capsules should be satisfactory to use with one-use crucibles in hot extraction or with the vacuum fusion technique.

A minimum of four determinations were made on each sample from the five containers and on a composite for each of the proposed SRM's. Previously issued NBS 353 was used as a control standard and run at the same time. The maximum observed deviations for hydrogen were as follows: SRM 1086 ± 3 ppm (n = 26), SRM 1087 ± 2.6 ppm (n = 28), and SRM 1088 ± 2 ppm (n = 27). Previously issued SRM 353, certified at 98 ± 5 (1 sigma) was run at the same time (n = 5) and yielded 98.6 ± 4.0 (1 sigma).

For Information Only

The approximate, NOT CERTIFIED, oxygen concentrations of the SRM's are as follows:

SRM	1086	1087	1088
Oxygen, ppm	(1350)	(840)	(1450)