LATEST REVISION AS OF 09/15/98

U. S. DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.
NATIONAL BUREAU OF STANDARDS
PROVISIONAL CERTIFICATE OF ANALYSIS
HIGH-TEMPERATURE ALLOY STANDARDS
FOR
OPTICAL EMISSION AND X-RAY SPECTROSCOPIC ANALYSES

NBS No.[a] / Designation	1190 Udimet 500	1203 Inco 713-A	1204 Inco 713-B	1205 Inco 713-C
Element[b]		Percent		
C	(0.10)[c]	(0.01)	(0.03)	(0.19)
Mn	.61	.31	.41	.29
Si	.22	.86	.56	.63
Cu	.093	.19	.12	.056
Ni	51.9	75.5	70.6	67.5
Co	19.1	---	---	---
Fe	(0.6)	(1.4)	(3.1)	(1.55)
Cr	17.0$_0$	11.9$_0$	12.7$_5$	13.8$_2$
Mo	3.80	3.01	4.28	5.75
W	0.08	<0.01	0.028	0.019
Al	2.83	4.34	5.60	6.68
Ti	3.57	1.09	0.63	0.36
Zr	0.11	0.05$_5$	.12	.46
Nb (Cb)	<0.01	1.00	1.31	1.95
Ta	< .01	0.34	0.46	0.67

a/ Size and metallurgical condition: Samples are approximately 1 1/4 in. square and 3/4 in. thick; they were chill cast by a rapid unidirectional solidification technique.

b/ The standards also contain the elements boron, phosphorous, and sulfur which are expected to be certified at a later date.

c/ Values in parenthesis are not certified, but are given for additional information on the composition.

The material for each standard was vacuum melted and cast at Allvac Metals Company, Monroe, N. C. Approximately 200-pound heats were melted in a high-frequency induction furnace and individual samples were chill cast simultaneously in a stack mold containing plates of steel onto which the molten metal solidified unidirectionally. The samples were finished by sand blasting the sides and machine grinding the top and bottom. The samples have been marked by NBS numbers on the top, opposite the chill-cast or test surface. (A serial number appears on one side near the top of the sample.)

The homogeneity of the standard samples was investigated by metallographic studies, by optical and x-ray spectroscopic analysis, and by chemical analysis at the National Bureau of Standards.

Chemical analyses were made by: R. K. Bell, E. E. Maczkowske, and E. R. Deardorff, Standard Reference Materials Section, National Bureau of Standards; A. L. Sloan, The Carpenter Steel Co., Reading, Pa.; A. D. Middletown, The International Nickel Co., Huntington Alloy Works, Huntington, W. Va.; S. Kallman, H. Oberthin, and J. Oberthin, Ledoux and Co., Teaneck, N. J.; and L. M. Melnick, U. S. Steel Corp., Monroeville, Pa.

(OVER)

CAUTIONS:

1. Determinations made on other than the chill-cast or test surface are not recommended because of the unidirectional solidification structure.

2. The chill-cast standards are designed for calibration in the analysis of samples prepared in the same manner; samples prepared by other casting techniques may exhibit a bias in the results.

3. The high-temperature alloys in general have poor heat conductivity. Because of this, differences in volatility rates for certain elements in optical emmission spectroscopic analysis may occur depending on the location of the burn and the source parameters.

4. Some of the samples exhibit voids or porosity at or near the top (opposite the test surface).

Harry C. Allen, Jr.

Harry C. Allen, Jr., Chief
Division of Analytical and
Inorganic Chemistry

Washington 25, D. C.
February 24, 1962