

Inorganic Application Note

Determination of Hydrogen in Aluminum[®] and Aluminum Alloys

Accessories

769-761 Crucibles, Methyl Alcohol, CP-Acetone, Hot air blower or small vacuum pump, lathe (for sample preparation).

Calibration Standard

Gas dosing or other suitable standard.

Sample Weight

~2 to 10 g

Program Settings

Analysis Constants

High Power Outgas	(0 to 100%)	100.00
High Power Outgas	(seconds)	90
Outgas Cooldown	(seconds)	100

*Surface Analysis:

Analysis Power Low	(0 to 100%)	60
Furnace on Time	(seconds)	15
Minimum analysis Time	(seconds)	100

Bulk Analysis:

Analysis Power Low	(0 to 100%)	55
Analysis Power High	(0 to 100%)	55
Max. Furnace on Time	(seconds)	50
Minimum Analysis Time	(seconds)	150
Comparator Level	(0 to 100%)	0.10
Crucible Adjust	(0 to 16 mm)	0

Analysis Parameters

Analysis Procedure	Combined
Crucible Height	Tall
Analysis Range	Low
Significant Figures	3
Sample Loading	Auto
Melt Detect	Off

Sample Preparation

NOTE: In order to obtain suitable results, it is recommended that the samples be machined on a lathe following the steps below.

1. Clean the lathe chuck and a cutting tool to remove all lubricants.
2. Wrap one end of the sample in aluminum foil to be secured in the chuck. Begin cutting at the opposite end. Do not touch the surface with bare hands.
3. Remove at least 0.4 to 0.6 mm from all surfaces, including the ends at 600 to 750 RPM. Maximum dimensions are 0.335 x 1.90 in.
4. Wash the sample with methyl alcohol or similar solvent and rinse in acetone.
5. Traces of solvents should be removed from the samples by a hot air blower or a small vacuum pump.

*NOTE: Enter "0" for bulk analysis only.



RH-402

Procedure

1. Prepare the analyzer and calibrate as outlined in the operator's instruction manual.
2. Determine the Blank as follows:
 - a. Enter a 5.000 g weight into the stack.
 - b. Press the LOADER CONTROL switch and place a crucible on the pedestal. Press the LOADER CONTROL switch again. The analysis will begin and end automatically.
 - c. Repeat steps 2a and 2b four or five times as needed and enter the average value through the Blank Program.
3. Determine the hydrogen content.
 - a. Weigh a freshly prepared sample and enter the weight into the weight stack.
 - b. Press the LOADER CONTROL switch and place the sample in the loading head.
 - c. Place a crucible on the pedestal and press the LOADER CONTROL switch again.
 - d. The analysis will begin and end automatically.

Typical Results

Sample	Weight (g)	Surface Hydrogen (ppm)	Bulk Hydrogen (ppm)
Norwegian Aluminum	7.713	0.013	0.154
Standard S.I. 453-03 @	7.919	0.012	0.168
0.16 ppm H	7.590	0.010	0.154
	7.804	0.014	0.178
	7.788	0.009	0.143
	7.370	0.014	0.155
	7.856	0.007	0.146
	7.856	0.006	0.154
	7.395	0.008	0.175
	7.889	0.010	0.169
	Average	0.010	0.160
	Std. Dev.	0.002	0.012

Sample	Weight (g)	Surface Hydrogen (ppm)	Bulk Hydrogen (ppm)
Norwegian Aluminum	7.714	0.008	0.129
Standard S.I. 17628 @	8.194	0.011	0.136
0.14 ppm H	8.169	0.005	0.127
	7.934	0.009	0.132
	7.852	0.012	0.141
	7.765	0.011	0.140
	8.053	0.005	0.136
	8.166	0.005	0.139
	8.056	0.008	0.136
	8.122	0.006	0.148
	Average	0.008	0.136
	Std. Dev.	0.003	0.006

Comments: Aluminum alloys that have been analyzed using this application include: AlCu, AlSiCu, AlMg, AlSi, AlLi, AlLiMg. Material containing Li or Mg will require cleaning of the reaction tube after 20 to 30 analyses. Follow operator's instruction manual for cleaning procedure.



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