

SEA NO.3 DEC.1989

Base Alloy Analysis

1. Overview

There are many types of base alloys such as SUS, Inconel, and Hastalloy that are selected based on their use. These alloys cannot be distinguished by physical appearance. This leads to fears of misapplication and a need for a simple technique of identifying alloy steels.

The SEA2001 can rapidly determine the composition ratio of a variety of base alloys without pre-treatment. Because the Fundamental Parameter Method (theoretical calculation method) is employed as the quantitative method, analysis can be performed with a standard sample and is simple enough that anybody can attain accurate analysis.

Below is an example of an analysis.

2. Analysis Conditions

Analysis conditions are listed in Table 1.

Table 1

Item	Settings
Collimator	8 mm
Tube Voltage	50 kV
Target	Rh
Atmosphere	Air
Measurement Time	300 seconds
Pre-treatment	none

3. Analysis Sample

BNRM'S (Brammer Non-destructive Reference Materials)
Metals Analysis Corporation

4. Quantitative Method

Fundamental Parameters Method (Theoretical Calculation Method)

5. Analysis Results

Table 1 Example of Base Alloy Analysis

(Units: %)

Element	Analysis Method	SUS	Cust	Invar	Inco	Hast	Brass	KOVAR
Fe	Chemical Analysis SEA	67.9	74.6	62.0	19.25	19.8	0.13	52.8
		68.77	75.78	63.18	19.46	19.83	0.16	53.75
Cr	Chemical Analysis SEA	16.5	15.02	0.18	18.18	22.7		0.09
		16.17	14.72	0.21	18.09	22.51		0.12
Ni	Chemical Analysis SEA	10.45	6.5	36.1	52.2	44.3	0.08	29.0
		10.41	6.16	34.85	52.03	44.31	0.12	27.72
MB	Jb Chem. Analysis SEA	1.70	0.29	0.98	0.07	0.82	< 0.01	0.25
		1.85	0.38	1.20	0.10	0.85	0.00	0.40
Mo	Chemical Analysis SEA	2.15	0.81	0.008	3.04	6.65		0.15
		2.39	0.91	0.006	3.33	7.26		0.16
Cu	Chemical Analysis SEA	0.27	1.48	0.031	0.05	1.97	61.7	0.12
		0.10	1.30	0.000	0.03	1.73	61.80	0.26
W	Chemical Analysis SEA		0.06	< 0.04		0.63		0.02
		0.10	0.00	0.54	0.00	0.98		0.67
Co	Chemical Analysis SEA	0.16	0.11	0.024	0.31	1.92		17.30
		0.00	0.00	0.000	0.37	2.02		16.93
V	Chemical Analysis SEA	0.18	0.082	0.001		0.05		
		0.17	0.072	0.001	0.00	0.20		
Nb	Chemical Analysis SEA	0.01	0.63	0.001	5.19	0.44		< 0.006
		0.00	0.66	0.000	5.70	0.49		0.000
Ti	Chemical Analysis SEA		0.006	0.002	1.00	0.015		< 0.002
		0.00	0.000	0.000	0.90	0.000		0.000
Sn	Chemical Analysis SEA	0.011	0.004	0.002			0.19	
		0.015	0.015	0.000			0.14	
Zn	Chemical Analysis SEA						34.85	
							34.39	
Pb	Chemical Analysis SEA						3.01	
							3.36	
Sb	Chemical Analysis SEA						0.022	
							0.031	

Note: SEA measures without standard samples.

6. Summary

Results of analysis of alloys such as SUS, Inco, Hast, and Brass show values to be very close to values obtained by chemical analysis, with an error of within $\pm 1\%$. Other alloys have an error of less than $\pm 1.5\%$. Accordingly, analysis of base alloys with the SEA2001 is precise, quick, requires no pre-treatment, and is very useful in determining many types of base alloy steels.