



INSTITUTE OF NON-FERROUS METALS
Analytical Chemistry Department

CERTIFICATE OF ANALYSIS
Bronze BN series

The average results of chemical analyses in wt %

Element No.	BN1	BN 2	BN3	BN 4	BN 5
Sn	6,47	6,21	9,29	9,81	11,82
Ni	0,226	1,64	1,04	0,635	2,69
Fe	0,495	0,589	0,153	0,0216	0,00731
Pb	0,0239	0,00514	0,0054	0,0145	0,00612
P	0,123	0,0769	0,00038	0,0066	0,0634
Zn	0,135	0,369	0,0625	0,00771	0,0560
Sb	0,117	0,0656	0,0088	0,0055	0,0314
Bi	0,118	0,0707	0,00098	0,00595	0,0298
Al	0,00286	0,00371	0,00126	0,00055	0,0245
Se	0,00335	0,0104	-	0,0134	0,00636
S	0,113	0,213	(0,0017)	0,112	0,0018
Si	(0,00839)	-	-	(0,00064)	(0,00211)
Cu	The rest	The rest	The rest	The rest	The rest

Gliwice 2011

Director of the Insitute

Prof. Ph.D. Zbigniew Śmieszek

The uncertainty in wt % at the probability level of 0,05

Element	No.	BN1	BN 2	BN 3	BN 4	BN 5
Sn		0,18	0,19	0,16	0,12	0,15
Ni		0,012	0,06	0,045	0,019	0,06
Fe		0,011	0,020	0,005	0,0019	0,00022
Pb		0,0009	0,00110	0,0005	0,0005	0,00049
P		0,010	0,0031	0,00013	0,0008	0,0051
Zn		0,010	0,019	0,0110	0,00052	0,0008
Sb		0,001	0,0008	0,0003	0,0009	0,0020
Bi		0,025	0,0023	0,00017	0,00035	0,0016
Al		0,00098	0,00097	0,00031	0,00004	0,0013
Se		0,00050	0,0007	-	0,0012	0,00036
S		0,007	0,036	-	0,010	0,0011
Si		-	-	-	-	-

Analytical methods applied:

- Sn* - determined by sodium hypo-phosphite reduction, potassium iodate titration, atomic emission spektrometry with horizontal and vertical ICP,
- Ni* - atomic emission spectrometry with horizontal and vertical ICP,
- atomic absorption spectrometry,
- Fe* - atomic emission spectrometry with horizontal and vertical ICP,
- atomic absorption spectrometry,
- Pb* - atomic emission spectrometry with horizontal and vertical ICP,
- atomic absorption spectrometry,
- P* - spectrophotometric, atomic emission spektrometry with horizontal and vertical ICP,
- Zn* - atomic emission spectrometry with ICP horizontal and vertical
- atomic absorption spectrometry,
- Sb* - atomic emission spectrometry with horizontal and vertical ICP,
- atomic absorption spectrometry,
- Bi* - atomic emission spectrometry with ICP horizontal and vertical,
- atomic absorption spectrometry,
- Al.* - atomic emission spectrometry with horizontal and vertical ICP,
- atomic absorption spectrometry,
- Se* - atomic emission spectrometry with vertical ICP,

- atomic absorption spectrometry,
- S - method of combusting and infrared SO_2 determination,
- atomic emission spectrometry with vertical ICP,
- atomic absorption spectrometry,
- Si - atomic emission spectrometry with ICP horizontal and vertical,
- weight method.

The chemical analyses have been carried out in four specialistic laboratories from Poland and two specialistic laboratories one from United Kingdom (EXOVA Ltd.) and second from Australia „Universal Scientifici Laboratoty” PTYLtd.), by various parallel methods. The bronze CRM were made by melting of all components in the coreless induction furnace and by casting into special cast iron moulds preventing elimination of segregation of the components during solidification. Homogeneity testing were made taking into account over 50% of the material produced. Investigation were carried out using atomic emission spectrometry method with low voltage spark. Homogeneity was estimated statistically with application of the test F. The set consists of 5 standard certified reference materials in form of discs 40 mm in diameter and 30 mm height.

Application for:

- atomic emission spectrometry with low voltage argon spark,
- XRF spectrometry.

Certified Reference Materials BN series are stable in time

Sale:

Institute of Non-Ferrous Metals

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