

Precise Determination of Major Constituents in Glass Material VII-12

This work describes the composition analysis of a standard glass material by ICP-AES and AAS. Precise and reliable results are available with know-how from long experience in TRC.

Sample: JCRM R 102 Borosilicate glass

Comparison between certified and analytical values

(unit: mass%)

	Certified Values	ICP-AES AAS	XRF WDX	XRF EDX
SiO ₂	80.5	80.4	80.9	96.6
Al ₂ O ₃	2.27	2.25	2.50	3.25
Fe ₂ O ₃	0.033	0.033	0.043	0.053
TiO ₂	0.011	0.011	0.012	ND
ZrO ₂	0.032	0.033	0.061	0.016
Na ₂ O	4.00	4.09	4.21	ND
K ₂ O	0.029	0.025	0.027	ND
B ₂ O ₃	12.7	12.8	21.0	ND

Each value is calculated as an oxide from the elemental concentration.

ICP-AES : SIINT SPS4000

AAS (for Na and K) : Hitachi-hitec Z2300

XRF(WDX) : Rigaku RIX3000

XRF(EDX) : Horiba MESA-500

•Preparation method

Si,B: Alkali fusion

Other element: Acid decomposition

• Measurement of WDX

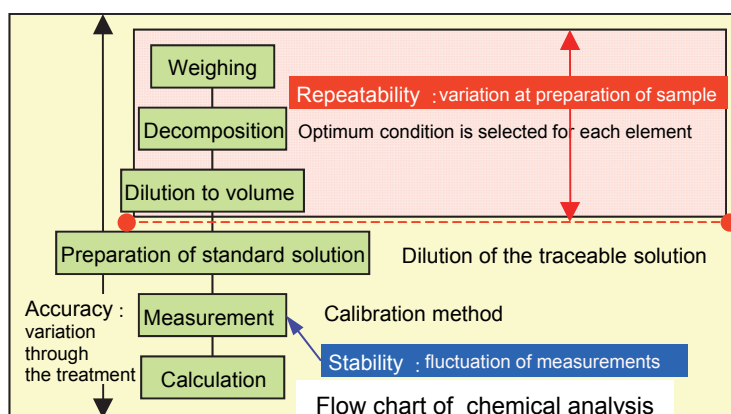
Comparison of the X-ray strength with standard material

Not considering the effects of coexisting materials

• Measurement of EDX

FP method

Reproducibility, repeatability, stability on compositional analysis

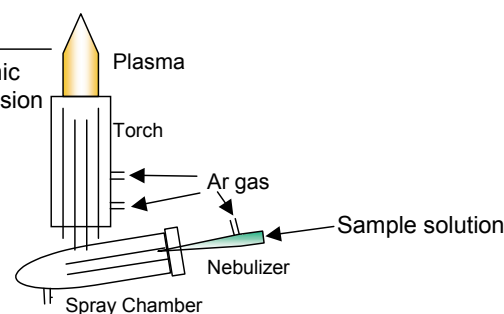
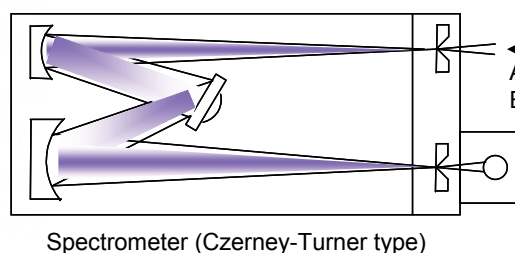
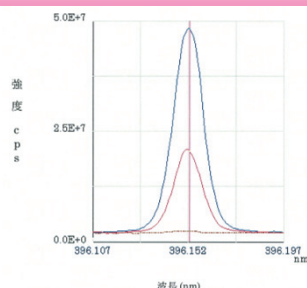


	Reproducibility		Relative Standard Deviation	
	Found (mass %)		CV(%) at 2 nd run	
	1st run	2nd run	Preparation	Measurements
Al ₂ O ₃	2.25	2.22	0.30	0.53 ~ 0.85
Fe ₂ O ₃	0.033	0.032	0.71	0.56 ~ 0.94
TiO ₂	0.011	0.011	1.0	0.35 ~ 0.71
ZrO ₂	0.033	0.034	0.54	0.68 ~ 0.96
Na ₂ O	4.09	4.06	0.24	0.20 ~ 0.42
K ₂ O	0.025	0.025	0.72	0.25 ~ 0.50

The quantitative values are the means of the results obtained by 2-5 times analyses started from sampling. There is long interval of several years between 1st and 2nd runs.

Each CV% was calculated from the results of 5 times analyses.

Spectrum and schematic of ICP-AES



Compositional analysis by ICP-AES and AAS gives us

- results equal to the certificated values,
- results with high reproducibility, repeatability and stability,
- results for Li,B with high difficulty in other technique.

However, chemical preparation without any loss and contamination is necessary to obtain precise values.