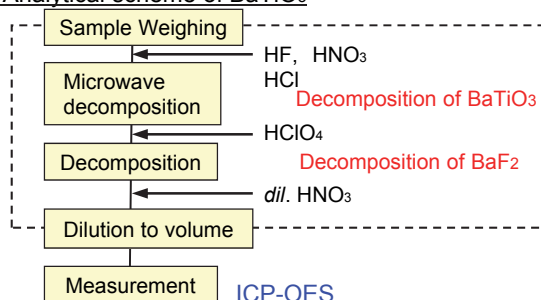


High Precision and High Sensitivity Analyses of Ceramics by ICP-OES and ICP-MS

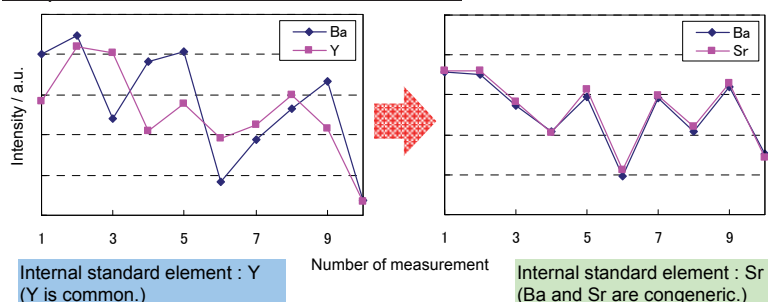
Characteristics of ceramics are influenced by its major and impurity elemental contents. We can perform relative comparison of major elemental ratio (Ba/Ti) in BaTiO₃ with 3 σ of less than 0.4 % by ICP-OES and determination of trace impurities with detection limit of 0.X μ g/g by ICP-MS. These services are possible by our accumulated know-how, skillful pretreatment and tuned measurement methods.

High-precision analysis of elemental ratio by ICP-OES

1. Analytical scheme of BaTiO₃



2. Optimization of Internal standard method



It is possible to compare relative elemental ratios between the samples high-precisely by the optimization of the internal standard method, because of correcting for the influence of emission intensity fluctuation.

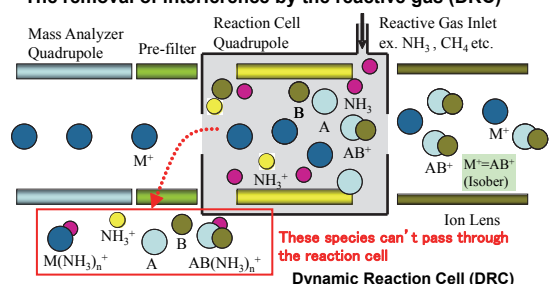
3. Results

Samples A&B: Commercial BaTiO ₃			Absolute calibration method				Internal standard method			
			Analytical Valued (mass%)	3 σ _{Measurement} (%)	Ba/Ti (composition ratio)	Ba/Ti (3 σ _{MAX})	Analytical Valued (mass%)	3 σ _{Measurement} (%)	Ba/Ti (composition ratio)	Ba/Ti (3 σ _{MAX})
A	Ba	1 st	58.63 $\pm$ 0.42	0.71	0.995	1.2 %	58.24 $\pm$ 0.07	0.12	0.988	0.34 %
		2 nd	58.17 $\pm$ 0.25	0.43	0.987		58.35 $\pm$ 0.07	0.11	0.989	
	Ti	1 st	20.55 $\pm$ 0.18	0.86			20.56 $\pm$ 0.06	0.28		
		2 nd	20.56 $\pm$ 0.11	0.53			20.58 $\pm$ 0.03	0.14		
B	Ba	1 st	58.32 $\pm$ 0.47	0.81	1.001		58.87 $\pm$ 0.12	0.19	1.004	
		2 nd	58.40 $\pm$ 0.20	0.34	1.004		58.76 $\pm$ 0.03	0.04	1.003	
	Ti	1 st	20.32 $\pm$ 0.12	0.57			20.44 $\pm$ 0.03	0.15		
		2 nd	20.27 $\pm$ 0.12	0.55			20.42 $\pm$ 0.03	0.12		

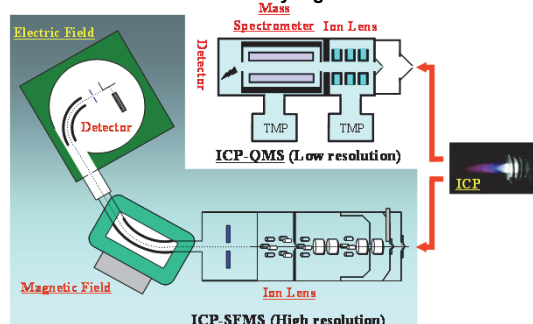
Determination of trace impurities by ICP-MS

1. Suppression of interference in ICP-MS

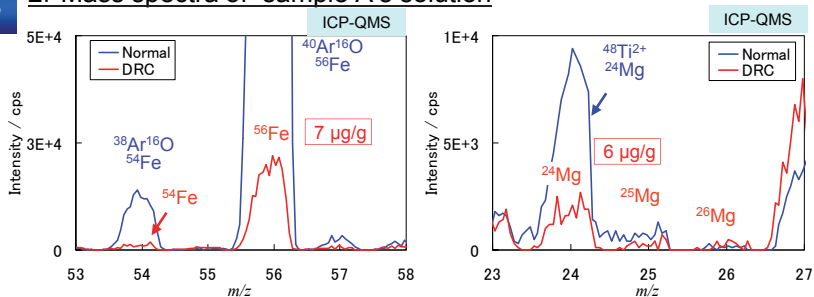
• The removal of interference by the reactive gas (DRC)



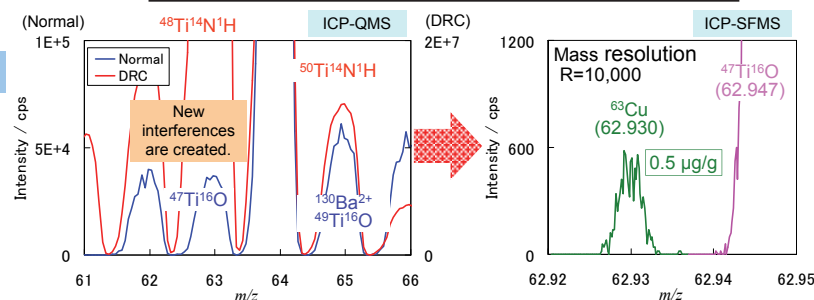
• The removal of interference by high resolution



2. Mass spectra of sample A's solution



ICP-DRC-MS reduces ArO and ⁴⁸Ti²⁺ interferences.



⁴⁷Ti¹⁶O interference leads to an error in the calculated concentration of ⁶³Cu.

ICP-SFMS separates analyte peaks from adjacent peaks.

The techniques of pretreatment and spectrum analysis permits the determination of trace impurities even at the level of 0.X μ g/g !