

## Application note #4: Analysing ceramic materials

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### Background

Is it possible to analyse ceramic materials. Can X-MET analyse solid ceramic materials and check if these are within specifications. Can pollutions in ceramic materials be determined and can the HH XRF recognize materials?

### Instrumentation

The requirement for a rapid, simple analysis (carried out by non-laboratory staff) on site makes field-portable energy-dispersive X-ray fluorescence (EDXRF) spectrometry the ideal analytical technique for process control. XRF is a widely used analytical technique for the determination of ceramic materials. The X-MET GEO is developed to analyse materials like ceramic materials.



### Sample preparation and measurements

Initial results are displayed on the analyser's large (4.3") integrated touchscreen within seconds. A typical analysis time for ceramic measurement is  $\pm$  30-60 seconds. No sample preparation is with needed.

### Ceramic materials

The X-MET Geo is developed to analyse ceramic materials. In this case study an application was developed for refractory materials. Some known samples were delivered to create an calibration model.

The GEO can be calibrated with solid materials, powders and liquids. In this case, some solid materials were used.



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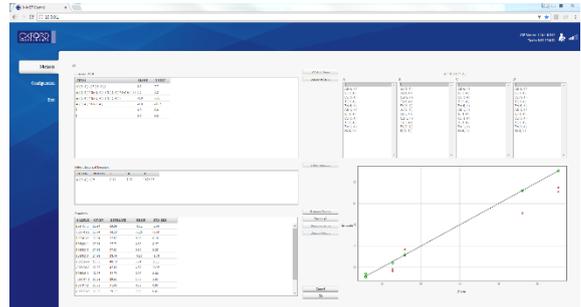
### Empirical Calibration (EP)

The known samples were made of Al<sub>2</sub>O<sub>3</sub> based materials.

Each sample was analysed for 60 seconds and the analyses were repeated 3 times per sample. The more repeats, the more accurate the model will be.

All sample have been analysed 4 times to check the model on different spots.

Name	Class	Date	Duration	K2O	Fe2O3	TiO2	SiO2	Al2O3	CaO
Sample 1	Cermamics	19.9.2017	31	0.25	0.61	0.55	34.63	58.72	0.08
Reference value				0.24	0.85	0.48	35.77	62.22	0.12
Sample 2	Cermamics	19.9.2017	31	0.25	0.76	1.43	43.50	53.67	0.12
Reference value				0.25	0.88	1.50	44.21	52.72	0.12
Sample 3	Cermamics	19.9.2017	31	0.00	0.01	-0.04	4.32	91.70	0.08
Reference value				0.01	0.03	0.02	0.01	99.60	0.07
Sample 4	Cermamics	19.9.2017	31	0.37	0.74	2.16	36.23	57.97	0.15
Reference value				0.37	0.83	2.05	34.12	59.28	0.13
Sample 5	Cermamics	19.9.2017	31	0.03	0.08	0.05	6.33	88.58	0.05
Reference value				0.01	0.06	0.01	8.67	90.81	0.05



### Database

The chemistry of the samples were added to a database. During analysis the type of material can be shown, if the unknown material is matching to a known material which is in the database. Also the deviations in comparison with the known material are indicated with coloured markers and in the test report.

### Summary

Once calibrated, Hitachi High-Tech Analytical Science Instruments' X-MET8000 GEO provides accurate and repeatable layer thickness analysis for a wide variety of applications.

The X-MET's ease of use and ruggedness make it an ideal tool on the shop floor for the incoming inspection of parts or components, as well as for process and quality control.

The versatility of the calibration software also enables the analysis of plating solutions (single and multi-elements), ensuring the rapid monitoring of the plating baths composition. With results being available on the X-MET's large integrated screen in seconds, decisions to accept/reject a part or modify the plating process can be made on the spot, maximising productivity and savings costs.

### Contact

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