

# X-SUPREME8000

## X-Supreme8000 for the rapid determination of $\text{TiO}_2$ and $\text{ZnO}$ in cosmetics and sun lotions

### BACKGROUND

Metal oxides such as titanium oxide ( $\text{TiO}_2$ ) and zinc oxide ( $\text{ZnO}$ ) are commonly used in sun lotions and other cosmetics to provide a physical barrier against the sun's harmful UVA and UVB radiations. The effectiveness of this barrier depends on the oxides content, as well as their form and particle size. With modern advances in formulation chemistry it is now possible to manufacture transparent formulations that use nanometre-scale oxides. These nano-pigments are now common ingredients in make-up, cosmetics and lotions, delivering sun protection without altering other properties.

As active ingredients,  $\text{TiO}_2$  and  $\text{ZnO}$  contents must be controlled during the manufacturing process to ensure consistent quality, and results must be reported accurately to meet regulations.

### OUR SOLUTION FOR RAPID ON-SITE QUALITY CONTROL OF COSMETICS

With the Hitachi High-Tech X-Supreme8000 energy-dispersive X-ray fluorescence (EDXRF) analyser, the routine analysis of cosmetics couldn't be easier. Testing is carried out by pouring a sample into a sample cup, placing the cup on the analyser's sample tray, closing the lid, entering the sample name, and pressing a button to start the measurement. The  $\text{TiO}_2$  and  $\text{ZnO}$  contents are measured simultaneously, and the results are displayed within seconds on the large, industrial touch screen. Pass/Fail messages can be setup to show whether the sample meets specifications for rapid decision making.

Combining a field-proven X-ray tube and Hitachi's high-resolution silicon-drift detector (SDD), the X-Supreme delivers fast and accurate results day after day. It includes several features that help protect against potential damage caused by sample spills or leaks, thus minimising downtime and preventing costly repairs. Sample cups fit inside a secondary safety window that will contain leaks from the cup should they occur. These windows are re-usable and the film can be changed in seconds (no need for a tool). The X-Supreme also includes an integrated sample changer that only places the sample above the X-ray tube and detector for the duration of the analysis, minimising the risk of damage or contamination to critical components.

A sample spinner is used for this application to compensate for any residual sample inhomogeneity and deliver repeatable results.



## SAMPLE PREPARATION

Classical methods of analysis are typically run by skilled laboratory staff, and require long sample preparation times, the use of potentially hazardous chemicals, and are ultimately destructive in nature. Analysis with the X-Supreme8000 involves virtually no sample preparation: the sample is slowly poured into a sample cup fitted with Mylar® film, ensuring there are no air bubbles trapped between the film and the sample. The cup is then placed over a safety window, also fitted with Mylar film, on the analysis tray. It's as simple and quick as that!

## PERFORMANCE AND RESULTS

A simple empirical calibration using optimised parameters (see Table 1) was created for titanium and zinc oxides by measuring a series of assayed sun lotions to establish the relationship between the elements' concentrations and their X-ray signals.

The data shown in Table 2 demonstrates the excellent performance the X-Supreme delivers for this application. The mid-range precision was determined from 10 repeat measurements of a known sample containing 2.8% TiO<sub>2</sub> and 3% ZnO.

Note: Users can develop their own calibrations for a wide variety of products as required (help is on hand with our Applications engineers if and when needed).



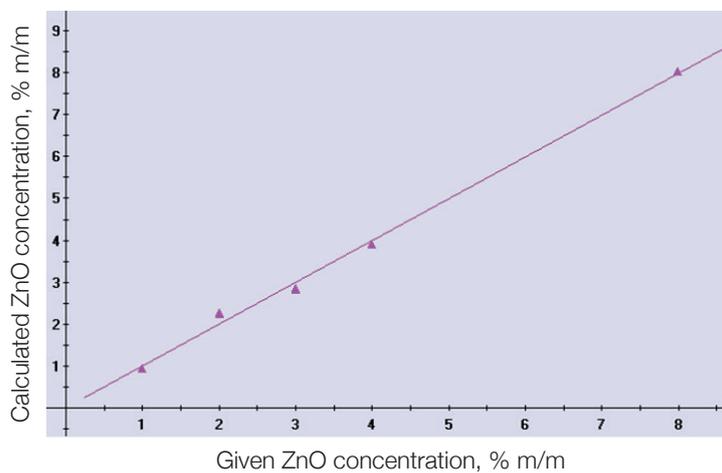
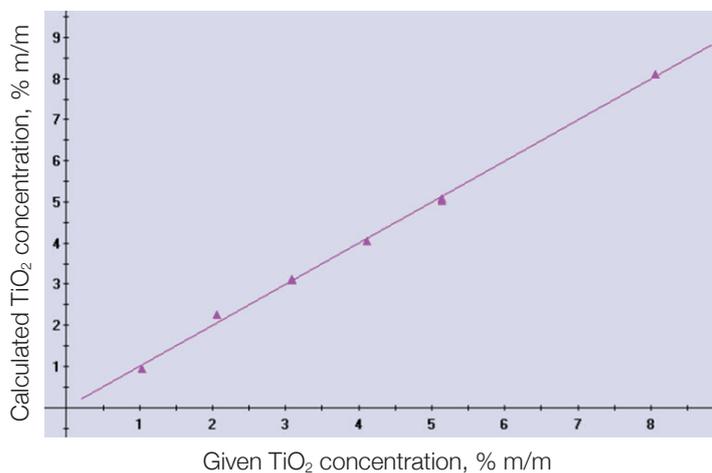
**Table 1:** Instrument parameters

| Analytes         | Region of interest (keV) | Excitation condition            | Measurement time (seconds) | Regression setup |
|------------------|--------------------------|---------------------------------|----------------------------|------------------|
| TiO <sub>2</sub> | 4.40 – 4.64              | 15kV 30µA A6 filter<br>Air path | 45                         | Ti intensity     |
| ZnO              | 8.51 – 8.77              | Sample spinner ON               |                            | Self-absorption  |

**Table 2:** Typical calibration performance for this application

| Analytes         | Concentration range (% m/m) | Standard error of calibration (% m/m) | Precision (95% confidence) (% m/m) |
|------------------|-----------------------------|---------------------------------------|------------------------------------|
| TiO <sub>2</sub> | 1-8                         | 0.1                                   | 0.02                               |
| ZnO              | 1-8                         | 0.2                                   | 0.05                               |

**Graphs 1 and 2:** Calibration curves for TiO<sub>2</sub> and ZnO



## SUMMARY

The X-Supreme8000 provides a simple to use, non-destructive, quality control tool, and helps manufacturers ensure that each cosmetic product is within stringent formulation specifications. The intuitive user interface makes the instrument easy to use for any operator, and the ten position tray allows for unattended analysis thereby increasing efficiency.

Visit [www.hitachi-hightech.com/hha](http://www.hitachi-hightech.com/hha) for more information.



## ORDERING INFORMATION

The minimum needed for this application is:

- | X-Supreme8000 fitted with a Tungsten X-ray tube and a high-performance SDD
- | Sample spinner
- | Setting-up samples (SUSs): SUSI99D (low SUS for Ti and Zn), SUT120B (high SUS for Ti), SUZN05B (high SUS for Zn)
- | Liquids accessories pack with Mylar film



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