# Measure P content in Oil by E-lite


## Quantification of Unprecedented Low-level P By Monochromatic Excitation XRF

E-lite is an advanced benchtop energy-dispersive X-ray fluorescence analyzer using a monochromatic beam optimized for phosphorus (P) detection. It delivers industry-leading detection limits (LOD) through superior signal-to-background (S/B) ratio performance. The system is equipped with a fast silicon drift detector (SDD) tuned to minimize detector background noise. It enables efficient survey and precise quantification of trace-level P in oil matrices. The system configuration is illustrated in Figure 1.

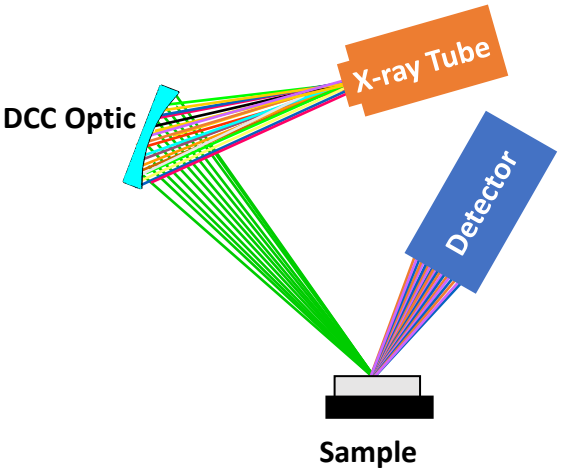


**Figure 1. Schematic of monochromatic energy dispersive x-ray fluorescence analysis**

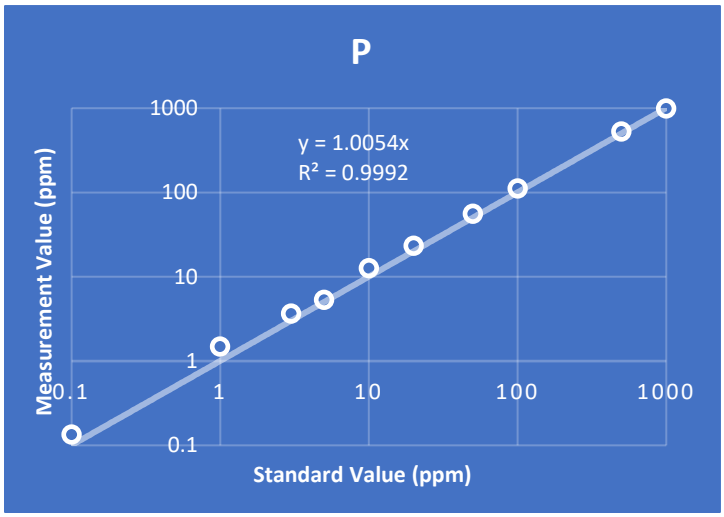


**Figure 2. P calibration curve in E-lite**

## Fundamental parameters (FP) approach

E-lite employs the fundamental parameters (FP) approach for calibration, utilizing certified reference materials to optimize FP coefficients. The FP approach allows E-lite to measure diverse oil types with a single calibration curve. Sample-specific custom calibration curves can also be established for enhanced accuracy when required. Figure 2 shows the P calibration in E-lite using oil reference standards. The plot illustrates excellent linearity across an extensive concentration range.

## Precision and Limit of Detection (LOD)

The precision and repeatability of E-lite are assessed using oil standard samples containing P at concentrations of 2.5 ppm, 5 ppm, and 200 ppm. Each measurement is completed in 300 seconds. Table 1 demonstrates consistent results for both low-level (2.5-5 ppm) and high-level (200 ppm) P concentrations. E-lite achieves an LOD of P at ~0.4 ppm for a single 300s measurement. Averaging two successive measurements can further enhances accuracy.

**Table 1. Repeats of Oil Standards 300s (ppm)**

| Sample | 2.5 ppm | 5 ppm | 200 ppm |
|---|---|---|---|
| 1 | 2.68 | 5.18 | 202.0 |
| 2 | 2.40 | 5.19 | 203.9 |
| 3 | 2.57 | 5.05 | 203.3 |
| 4 | 2.60 | 4.96 | 203.7 |
| 5 | 2.32 | 5.16 | 203.4 |
| 6 | 2.60 | 4.96 | 203.1 |
| 7 | 2.57 | 4.84 | 203.1 |
| 8 | 2.63 | 5.03 | 203.0 |
| 9 | 2.63 | 4.80 | 204.0 |
| 10 | 2.46 | 5.16 | 204.7 |
| Average | 2.55 | 5.03 | 203.4 |
| SD | 0.108 | 0.134 | 0.680 |
| RSD | 4.3% | 2.7% | 0.3% |

## Correlation with ICP and MB

Multiple oil samples are analyzed using both E-lite and ICP-MS for comparison. For each oil type, two to three replicates are tested. Figure 3 demonstrates the high consistency of results obtained from E-lite and ICP-MS.

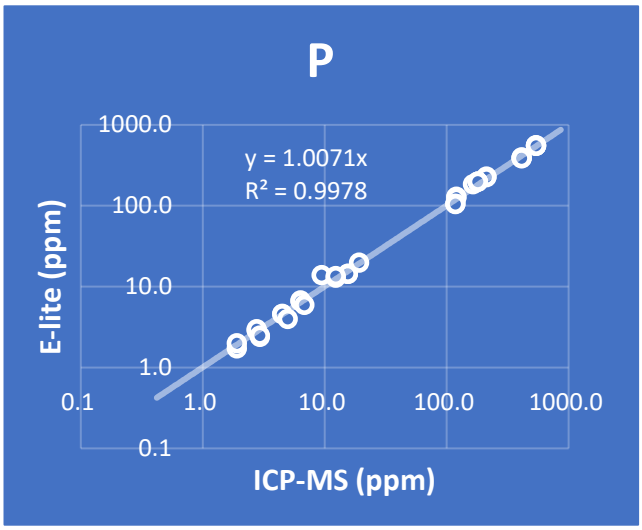


**Figure 3. E-lite vs. ICP-MS results**

A total of 80+ rapeseed oil samples are analyzed using E-lite and Molybdenum Blue spectrophotometric method. Figure 4 demonstrates excellent correlation between the results obtained from E-lite and the reference Molybdenum blue method.

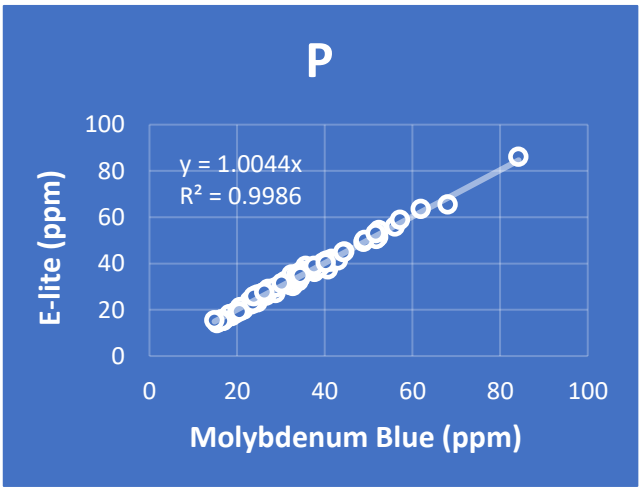


**Figure 4. E-lite vs. MB results**