Z-SPEC

POWERED BY XOS

# JP500

## A Portable and Robust Analyzer

## Quantify Heavy Metals in Food

**Optimized for Pb, As, Hg, Cu, Zn, and Se**


Pb

As

Hg

Ni

Se

## Heavy Metal Testing

Powered by Monochromatic X-Ray Fluorescence (MXRF) technology, JP500 can rapidly and precisely quantify heavy-metal elements in food. Its excellent performance meets the challenge of reliably measuring extremely low-level Pb, As, and Hg, at the 0.1 ppm level for As and Pb requested by FDA regulations. Testing more samples in a shorter period with accurate, reliable analysis, JP500 is a powerful tool for risk assessments of heavy-metal contamination in food and it enables producers and customers to monitor and reduce the health risks from heavy-metal exposure.

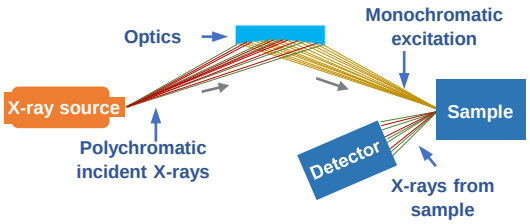
## Features

1. Ultra-high signal-to-background ratio and ultra-low detection limit;
2. Portable design: light-weight, and comfortable to carry;
3. Minimum sample preparation enables on-site sampling and quantification.

## MXRF Innovative Technology

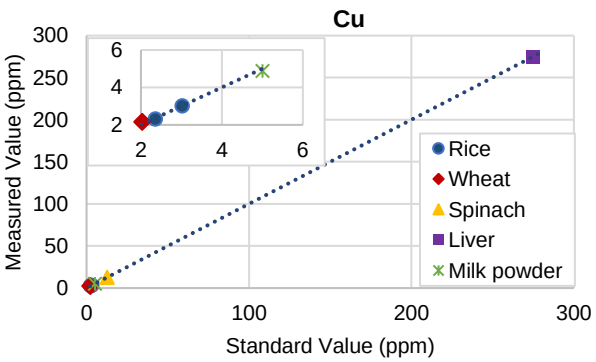
JP500 is powered by Monochromatic X-ray Fluorescence (MXRF) technology: an elemental-analysis technique offering significantly enhanced detection performance over traditional Energy-Dispersive X-ray Fluorescence (EDXRF) technology. This technique applies state-of-the-art monochromating and focusing optics, enabling dramatically higher signal-to-background ratio compared to traditional polychromatic X-ray Fluorescence. Figure 1 shows the basic configuration of MXRF and its use of focused monochromatic excitation.

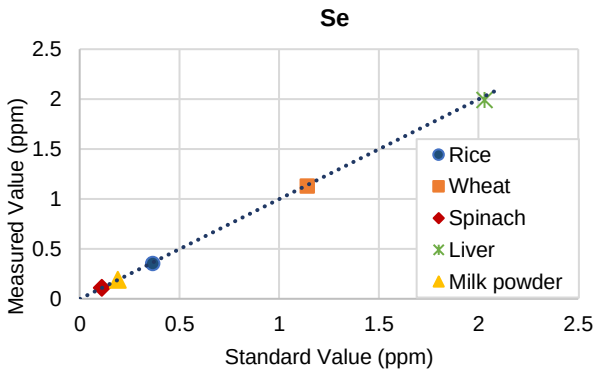
Figure 1. MXRF Technology

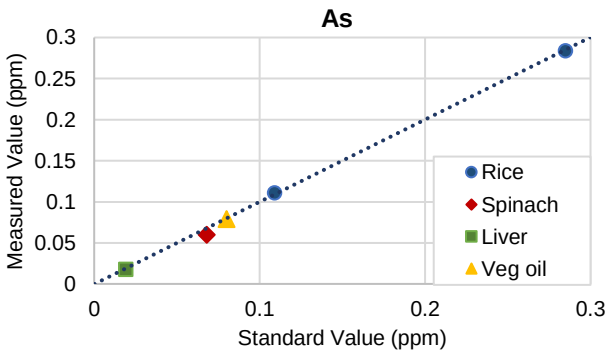


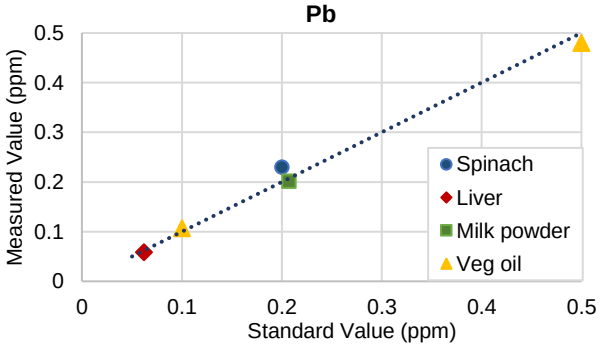

## Accuracy

Excellent linearity of measurement and standard values was used to verify the accuracy of the instrument, as shown below.



## Repeatability

Table 1 shows the results of repeated measurements on different standard samples to verify the stability and the accuracy.

| Table 1: Repeatability Test (ppm) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Cu** | | **Ni** | | **As** | | **Pb** | | **Se** | | **Hg** | |
| **Sample** | NIST1567 Wheat | BD151 Milk powder | Veg oil | NMIJ7502 Rice | Veg oil | NMIJ7502 Rice | NIST1577 Liver | BD151 Milk powder | NIST1570 Spinach | NIST1568 Rice | NIST1570 Spinach | BD151 Milk powder |
| **1** | 2.27 | 4.88 | 0.115 | 0.406 | 0.075 | 0.110 | 0.072 | 0.197 | 0.117 | 0.356 | 0.049 | 0.474 |
| **2** | 2.28 | 4.87 | 0.111 | 0.408 | 0.086 | 0.115 | 0.049 | 0.181 | 0.113 | 0.359 | 0.032 | 0.512 |
| **3** | 2.26 | 4.90 | 0.093 | 0.416 | 0.076 | 0.118 | 0.064 | 0.215 | 0.107 | 0.358 | 0.036 | 0.480 |
| **4** | 2.29 | 4.84 | 0.102 | 0.418 | 0.080 | 0.114 | 0.063 | 0.207 | 0.106 | 0.352 | 0.036 | 0.473 |
| **5** | 2.27 | 4.84 | 0.112 | 0.418 | 0.086 | 0.110 | 0.048 | 0.230 | 0.111 | 0.358 | 0.046 | 0.483 |
| **6** | 2.24 | 4.86 | 0.110 | 0.407 | 0.082 | 0.099 | 0.078 | 0.213 | 0.110 | 0.353 | 0.029 | 0.486 |
| **7** | 2.28 | 4.85 | 0.102 | 0.398 | 0.075 | 0.115 | 0.059 | 0.214 | 0.121 | 0.348 | 0.030 | 0.496 |
| **Average** | 2.27 | 4.86 | 0.106 | 0.410 | 0.080 | 0.111 | 0.062 | 0.208 | 0.112 | 0.355 | 0.037 | 0.486 |
| **Standard** | 2.03 | 5.00 | 0.100 | 0.390 | 0.100 | 0.109 | 0.062 | 0.207 | 0.110 | 0.365 | 0.030 | 0.520 |
| **SD** | 0.016 | 0.022 | 0.008 | 0.007 | 0.005 | 0.006 | 0.011 | 0.015 | 0.005 | 0.004 | 0.008 | 0.014 |
| **RSD (%)** | 0.7 | 0.5 | 7.2 | 1.8 | 5.9 | 5.4 | 17.9 | 7.3 | 4.7 | 1.1 | 21.1 | 2.9 |

## Realistic Sample Analysis

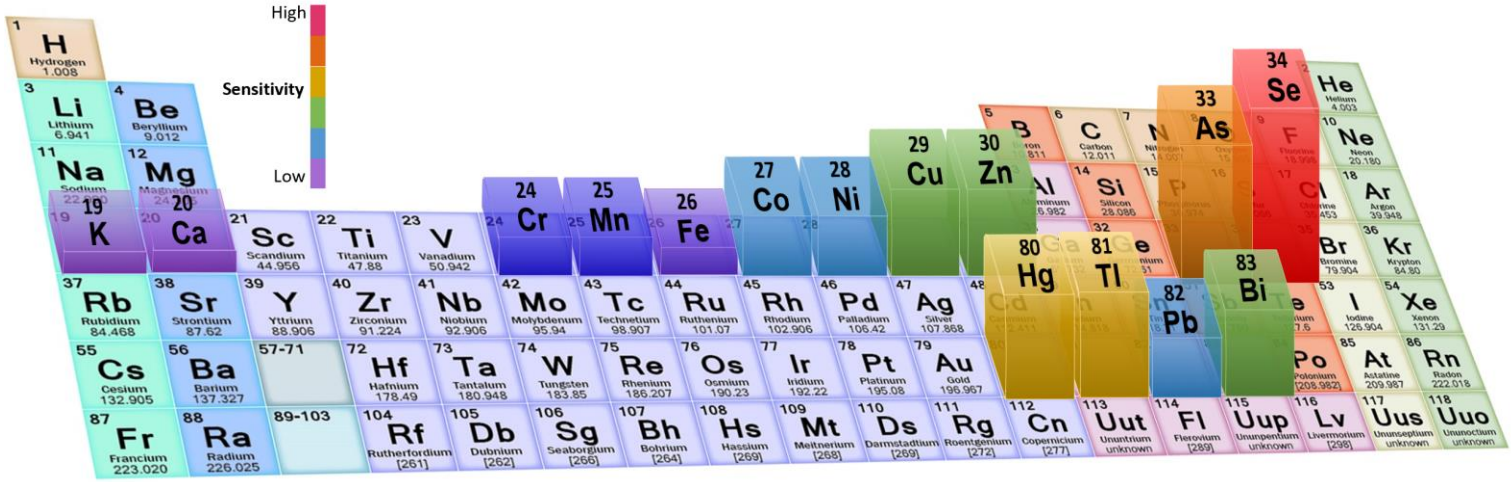
Table 2 shows the results for heavy metal analysis using JP500 for different kinds of food on the market, proving its capability of quantifying trace heavy metals in food.

| Table 2：Element Test in Food Sample (ppm) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sample** |  |  |  |  |  |  |  |
| | **Cereal** | **Orzo pasta** | **Dark Chocolate** | **Wine** | **Fresh tuna** | **Fresh spinach** | **Lolli pop** |
| **Cr** | 1.85 | 12.21 | ND | 0.203 | 0.142 | 2.18 | 0.200 |
| **Mn** | 25.24 | 10.84 | 7.58 | 1.61 | 0.085 | 2.30 | ND |
| **Fe** | 187.3 | 64.76 | 27.85 | 3.25 | 3.29 | 36.55 | 2.28 |
| **Ni** | 1.38 | 1.92 | 2.39 | ND | 0.211 | 0.532 | 0.108 |
| **Cu** | 2.51 | 3.53 | 8.09 | 0.134 | 1.39 | 1.25 | 0.181 |
| **Zn** | 18.90 | 14.36 | 16.69 | 1.41 | 4.29 | 12.91 | 0.134 |
| **As** | 0.015 | 0.022 | 0.031 | 0.018 | 0.613 | 0.017 | ND |
| **Se** | 0.127 | 0.559 | 0.050 | ND | 0.917 | 0.016 | ND |
| **Hg** | ND | ND | ND | ND | 0.362 | ND | ND |
| **Pb** | 0.042 | 0.070 | ND | ND | 0.087 | 0.137 | ND |

| Table 3： JP500 – Limit of Detection (ppm) Application: Trace Heavy Metals in Food | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element** | **As** | **Hg** | **Pb** | **Cr** | **Cu** | **Ni** | **Zn** | **Mn** | **Co** | **Se** | **Tl** | **Bi** |
| **Scan mode (100s)** | 0.035 | 0.035 | 0.07 | 0.25 | 0.06 | 0.07 | 0.06 | 0.25 | 0.07 | 0.02 | 0.035 | 0.07 |
| **Quantitative mode (600s)** | 0.015 | 0.015 | 0.03 | 0.10 | 0.025 | 0.03 | 0.025 | 0.10 | 0.03 | 0.009 | 0.015 | 0.015 |

## Specification

The following figure shows the detection sensitivity of JP500 to different elements.




| JP500 Specifications | |
|---|---|
| **Measuring time** | 30 - 1200 s |
| **Element range** | 40 elements between Al - U |
| **Data storage and output** | Printout, Ethernet, USB, internal storage, U disk |
| **I/O port** | Ethernet 10/100, USB |
| **Power** | 110-240 VAC ± 10%, 50-60 Hz (Hertz) Built-in battery 98 Wh (optional) |
| **Working temperature & humidity** | +41˚F - 104˚F (5˚C - 40˚C), 30 - 85 % |
| **Weight** | 9 kg |
| **Dimensions** | 30 cm W x 23 cm L x 26 cm H  |



## Z-SPEC & XOS

Z-Spec is a fast-growing manufacturer of X-ray analyzers founded by the inventor of the MXRF technique who formerly served as the chief scientist and advanced director of R&D for XOS. Through a strategic partnership with XOS, Z-Spec offers accurate, efficient, and reliable elemental analysis solutions optimized for environmental protection and public safety, like soil, water, food, and agriculture products.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