

## **Using Wavelength-Dispersive X-Ray Fluorescence (WD-XRF) as a Walkup, High-throughput Alternative to Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) for R&D Pharmaceutical Elemental Impurity Applications**

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Heavy metal impurities are critically assessed in pharmaceuticals due to possible toxicological effects. The International Conference of Harmonization (ICH) lists permitted daily exposures (PDE) for each element, and materials must be within these specifications (1). Currently, inductively coupled plasma spectrometry (ICP) is the most commonly used technique to measure metals within the pharmaceutical industry. However, ICP has several drawbacks including, but not limited to, difficult sample preparation (using strong acids, for digestion of samples), sample destruction, daily calibration, and potential carry-over between samples.

Wavelength-dispersive X-ray fluorescence (WD-XRF) is an alternative technique for elemental impurity analysis used across several industries for a variety of applications. However, there is limited information evaluating the technique for pharmaceutical applications. Advantages of WD-XRF include minimal sample preparation, non-destructive analysis, and absence of daily calibration.

We evaluate the benefits and capabilities of WD-XRF, comparing quantitative performance with ICP-OES methods while additionally investigating the feasibility of creating a walk-up workflow with high-throughput capability. Additionally, we explore the instrument's internal semi-quantitative application.

- 1) ICH Q3D Elemental Impurities Guidance for Industry, September 2015