Novel Approaches to quantifying light elements in complex matrices using benchtop Energy Dispersive X-Ray Fluorescence (EDXRF)

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Manufacturing Plant laboratories desire ever-faster turn-around times to increase data density and avoid potential sample aging issues. As such, most of the quality control analyses are conducted in-house. Many of these analyses include quantifying metal concentrations in sample matrices ranging from raw materials to final products. Recent advances in bench-top Energy Dispersive X-Ray Fluorescence (EDXRF) instrumentation, has allowed Dow Chemical Company to implement XRF quantification methods in the manufacturing laboratory that would traditionally require the use of a Wavelength Dispersive X-Ray Fluorescence (WDXRF) instrument in a Research and Development lab.

Though EDXRF unit has advantages, such as the low cost, ease of operation and maintenance as well as the robustness required for use in a manufacturing environment, there are certain limitations such as; the inability to perform analysis under inert atmosphere (vacuum), lower resolution, spectral overlap and lower source power. These pitfalls become especially evident while measuring lighter elements (Na-Ca). Unfortunately, these elements are often the major species of interest.

With careful optimizations of measurement conditions, de-convoluting multi-element spectra, judicious application of correction factors and optimized sample preparation; especially in applications where conventional sample preparation is problematic, light elements have been quantified with high accuracy and precision using the most basic energy dispersive units.

The unique approaches employed for solving complex problems and developing fast and sensitive EDXRF methods for quantifying light elements in low concentrations are discussed herein.