The Creation and Practical Application of Industry Standards Water Analysis via PXRF

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Approximately 2.2 billion people lack access to safely managed water supplies. Biological contaminants and heavy metals pose considerable threats to humanity, but are often expensive to detect, leading to millions of preventable deaths annually. Portable X-Ray Fluorescence (pXRF) is an increasingly common method of analysis for a variety of matrices. Water provides considerable challenge for pXRF due to its minimal density. Additionally, there are notable influencing factors on the accuracy of pXRF including protective film type, sample depth, and sample concentration. Hence, this study aimed to establish the depth of a sample, film type, and mathematical correction best suited for pXRF water analysis. For this, 1,440 samples of aqueous three different ICP standards (Lead, Chromium, and Cadmium) were scanned with three different film types (Kapton, Prolene, and Mylar) at four different concentrations (125, 250, 500, 1,000 ppm) with five depths (4.29, 8.59, 17.18, 25.77 and 30.06 mm). Before mathematical correction, no depth or film type provided accurate results. However, after creating mathematical correction, a T-test revealed that for a majority of samples, any of the three films and a volume of only 4.29 mm gave sufficient results. A rapid, portable, and cost effective water analysis technique, like pXRF, has the power to save thousands of lives by easily identifying safe, potable water for everyday use and consumption. With no operational costs and limited scan time, pXRF is the future of such analytics.

Awards Won:
Second Award of $2,000