APPLICATION OF MICRO-XRF FOR NUCLEAR MATERIAL FORENSICS AND PROBLEM SOLVING
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A number of spatially resolved, imaging analytical and materials science techniques (eg. scanning electron microscopy with X-ray detection) are commonly employed to examine plutonium and other nuclear materials (NM). Until recently, however, Micro-X-ray fluorescence (MXRF) instrumentation had been relatively uncommon and underutilized for spatially resolved NM analysis and imaging. As global NM proliferation continues to expand, the value of effective NM forensic tools is obvious. Here, a number of plutonium forensic and materials problem solving applications will be presented to demonstrate the power and utility of MXRF for providing unique, spatially resolved elemental composition information. Applications discussed will include the following: location and identification of plutonium particles on HEPA filters and surface swipes, identification of multiple insoluble fractions in plutonium and neptunium oxide material, and spatial mapping of unexpected impurities in (what was expected to be) high purity plutonium metal. The technical challenges and instrumental method development to overcome these challenges will be discussed.