Rapid Chemical Characterization of Black Mass via Portable XRF Analysis

Marcus Johnson[1], Dillon McDowell[1]

[1]Analytical Instruments, Evident Scientific, USA

Electric vehicles (EVs) have rapidly gained popularity among environmentally conscious individuals as a sustainable mode of transportation. These vehicles rely on lithium-ion (Li-ion) batteries and associated energy storage technologies. The demand for Li-ion batteries has exhibited a remarkable year-over-year growth of over 50% since 20211, underscoring the need for increased production of raw materials to support this surge. Along with lithium, important metallic elements like cobalt, manganese, and nickel are integral to battery manufacturing. However, the sources for these essential materials are progressively depleting, necessitating the implementation of strategies to maximize material reuse to meet escalating demand. The burgeoning EV recycling market is currently valued at about 11 billion dollars.2 A smart approach to reutilize waste materials, specifically shredded battery waste referred to as 'black mass,' presents a promising avenue for raw material reclamation. To facilitate efficient and cost-effective processing, rapid characterization of black mass sources becomes imperative. Portable X-ray fluorescence (pXRF) is an apt tool for measuring metal content within black mass, requiring minimal sample preparation and eliminating the need for acid digestion. The advantage of pXRF is its ability to swiftly analyze dry and pulverized black mass samples "as is," enabling users to acquire total elemental compositions with high precision and accuracy.