How does solid microanalysis profit from innovations in EUV research

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Research into new sources for EUV lithography is driving advancements in experimental methods tailored for this short wavelength range. This progress enables the exploration of spectroscopic techniques aimed at monitoring electronic transitions within this energy spectrum. Laser-induced breakdown spectroscopy (LIBS) serves as a rapid tool for elemental analysis, primarily established in the UV-vis range. However, LIBS encounters challenges such as limited repeatability precision and elevated background noise resulting from continuum radiation.

In parallel, laser-induced extreme UV spectroscopy (LIXS) delves into the initial stages of plasma evolution, characterized by the emergence of soft X-ray and extreme UV radiation. The method benefits from a fast timeframe and constrained plasma confinement, leading to better precision. Nevertheless, LIXS encounters convoluted spectra arising from unresolved transition arrays (UTA), particularly pronounced for heavier elements. This complexity renders conventional univariate data analysis impractical, demanding the adoption of a multivariate data analysis approach.

Multiple cathode samples, each coated with varying stoichiometries of lithium nickel manganese cobalt oxide (NMC), were prepared and used for calibration purposes. Through the application of Partial Least Squares (PLS) regression, a robust correlation with an R2 value exceeding 0.97 was achieved. The LIXS technique underwent a comparative evaluation against UV-vis LIBS. Furthermore, a comparison between univariate and multivariate analysis approaches was conducted, incorporating validation through y-randomization to mitigate overfitting risks.

The viability of this approach was confirmed through the testing of an NMC reference material. The results showed metrological compatibility with reference values, underscoring the potential capability of the proposed methodology.