Application Note BATT1005

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BATT1005 - Main Component Analysis for NCM Cathode Material

Introduction

In NCM cathodes, Ni, Co, and Mn composition is a key factor in determining battery properties. ICP analysis is generally used to determine composition. However, sample preparations, such as acid dissolution, and dilution are necessary. With XRF, it is possible to swiftly and readily perform analysis with the materials still in powder form.

Additionally, with the standardless FP method, precise composition analysis can be performed without preparing standard samples or a calibration curve.

Composition analysis

- **Analysis:** Processed materials
- **Analysis method:** Standardless FP analysis method
- **Use:** Quality assurance
- **Analyzed materials:** $Li(Ni_xCo_yMn_z)O_2$

Table 1: Standardless FP analysis results for powder (Molar ratio)

Sample		Ni	Co	Mn
Sample A NCM (0.33/0.33/0.34)	Analysis Value	0.332	0.326	0.342
	ICP	0.33	0.33	0.33
Sample B NCM (0.85/0.10/0.05)	Analysis Value	0.847	0.098	0.055
	ICP	0.85	0.10	0.05
Sample C NCM (0.5/0.2/0.3)	Analysis Value	0.507	0.198	0.295
	ICP	0.50	0.20	0.30

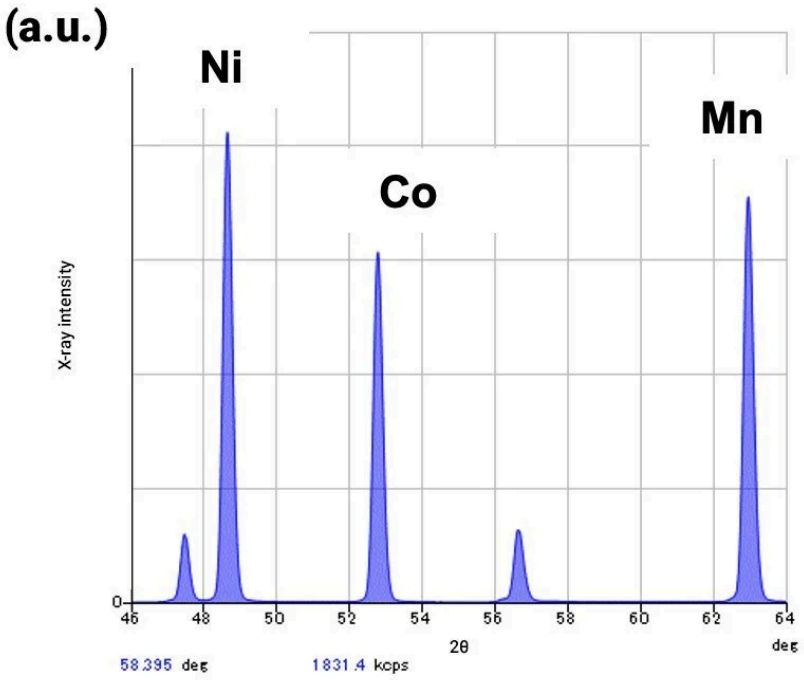

Figure 1: Spectrum

Conclusion

Ni, Co, and Mn ratios in NCM obtained through the standardless FP analysis method were shown to be consistent with those from ICP analysis. It is possible to obtain similar results in an electrode status as well as powders, which is commonly used for elemental analysis. With XRF analysis, the preparation of a calibration curve and sample preparation steps such as acid dissolution and dilution, which are required in ICP analysis, are not necessary. For that reason, XRF analysis makes it possible to significantly reduce running costs and work times.

Related products

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Benchtop tube below sequential WDXRF spectrometer anal
yzes O through U in solids, liquids and powders