

Total quantification of Mg alloys by X-ray fluorescence spectrometry

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Magnesium alloys are used for example as automobile, airplane and railway components, mobile electronics and acoustic devices. This is because of its unique characteristics such as having low specific weight, high vibration damping, dent resistance, dimensional stability and ability to shield electromagnetic waves. Several elements are added to Mg alloys for improvement of certain characteristics.

Magnesium alloys can be analyzed by various standardized test methods such inductively coupled plasma optical emission spectrometry (ICP-OES) and spark discharge optical emission spectrometry (SD-OES). In this presentation, analysis of Mg alloys by X-ray fluorescence spectrometry is discussed. XRF analysis is known to be a quick, accurate, sensitive and non-destructive technique. It can be used by non-technical users since it does not require high skill levels to produce reliable data with high accuracy and precision. Due to these reasons, total quantification of Mg alloys by XRF analysis has been investigated.

Quantitative and semi-quantitative analysis based on qualitative spectra were carried out for 11 elements in Mg alloy. For quantitative analysis, calibration curves were set up using Mg alloy certified reference materials (CRMs) available from MBH Analytical Ltd. Table 1 shows XRF analytical results of CRM 61X MgP2. XRF quantitative analysis results are in good agreement with the certified values even for trace elements. Semi-quantitative analysis which can be used for screening without the need for standard samples is also in good agreement with the certified values due to the development of fundamental parameter method technique. Detailed experimental results by XRF analysis and sample preparation method of Mg alloys will be discussed.

Table 1 XRF analysis results of standard sample (CRM 61XMgP2) unit:[mass%]

Element	Quantitative results	Semi-quantitative results	Certified value
Mg	98.831	98.816	99.82
Al	0.0654	0.0669	0.062
Ca	0.0137	0.0129	0.0139
Fe	0.0056	0.0059	0.0061
Ni	0.0025	0.0043	0.0029
Cu	0.0109	0.0106	0.0109
Zn	0.0111	0.0104	0.0122
Ag	0.0037	0.0035	0.003
La	0.0012	0.0015	0.0014
Ce	0.0017	0.0018	0.0019
Pb	0.0075	0.0048	0.0061