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Analysis of Alloys by Fluorescent X-Ray Spectroscopy* Non-Destructive-Addition Method

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Abstract

In order to determine metal samples rapidly and with a few standard samples, a new method, non-destructive-addition method was proposed. As theoretical equations for this method, the following equations were introduced:

$$x = \frac{a \left(\frac{I_M}{I_a} - 1 \right)}{\frac{I_M}{I_x} \cdot (1 - a) + \frac{I_M}{I_a} a - 1}$$

where x is the weight fraction of the element to be analyzed in the unknown sample and I_x is X-ray intensity of it, a is the weight fraction of the element to be analyzed in the standard sample and I_a is the X-ray intensity of it, I_M is the X-ray intensity of the pure metals of the element to be analyzed; and

$$\frac{\frac{I_M}{I_{M'}} \cdot \frac{W_{m'}}{W_m} - 1}{W_{m'} - W_m} = \frac{\frac{I_M}{I_{M''}} \cdot \frac{W_{m''}}{W_m} - 1}{W_{m''} - W_m}$$

where W_m and $W_{m'}$ are weight fraction of the element to be analyzed in the standards and $I_M, I_{M'}$ are the X-ray intensity of them, $W_{M''}$ is the weight fraction of the element to be analyzed in the unknown sample and $I_{m''}$ is the X-ray intensity of it. After preliminary experiments on some powdered samples, these equations were applied to the determination of some metals, for example nickel, chromium or manganese in steels. Satisfactory results were obtained.

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