Ain Shams University,
Women's College
For Arts, Science and Education,
Cairo. Egypt.

Preparation and Certification of some types of Steel Alloy Reference Materials

A Thesis

Submitted to the Chemistry Department
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In Fulfillment of the Requirements for the
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رساله مقدمه لنيل درجة دكتوراه الفلسفة فى العلوم (الكيمياء غير العضوية و التحليلية) من الباحثة

/ راندا نصر أحمد يمانى الي كلية البنات للأداب و العلوم و التربية – جامعة عين شمس.

Abstract

Certified reference materials (CRMs) are versatile tools to support quality, correctness and credibility of measurement results. They are used to provide the traceability of the measurement results to the SI unit. In the present work, seven low alloy steel and three high alloy steel reference materials were developed by the national institute of standards (NIS), Egypt. Homogeneity of the developed RMs was studied by x-ray fluorescence spectrometer (XRF) and atomic emission spectrometer and the results proved that the RMs were homogeneous enough. Characterization of reference materials composition was performed by different independent analytical methods; gravimetric, XRF, optical emission and atomic absorption spectrometry in different laboratories. The assigned values of the mass fractions of the various elements of the alloys and their associated uncertainty were calculated by the weighted mean approach.

Keywords:

Low alloy steel, high alloy steel, Homogeneity, Reference materials, Traceability

Aim of the work

The quantities of steel products used for different industrial purposes are enormous. The determination of the chemical composition of iron and steel products is important not only for the users but also for the manufacturers and the assessment of compliance of these products with their technical specifications is the main tool to judge their quality and to decide their industrial application. Assessment of compliance is done by measurements using different techniques such as X-ray fluorescence spectrometry, optical emission spectrometry, atomic absorption spectrometry, and inductivity coupled plasma techniques. The measurement methods used by laboratories are either standard methods or validated methods if possible where certified reference materials (CRMs) are versatile tools for internal validation studies. CRMs also play important role in verification of the accuracy of analytical measurement results. They are generally used to: 1) assure the quality of the measurement results, 2) to establish the traceability of the measurement results to the internationally agreed SI units, 3) to calibrate measuring instrument to establish the reliability of its reading and 4) to estimate the uncertainty of the measurement results, enabling them to be compared with other results, references, specifications or standards.

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