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CERTIFIED REFERENCE MATERIALS FOR ANALYTICAL QUALITY CONTROL IN NEUTRON ACTIVATION ANALYSIS

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Abstract

Analytical quality control in neutron activation analysis (NAA) requires the use of certified reference materials (CRM) in order to produce reliable analytical results. It is essential to evaluate the performance of NAA method when analyzing various sample matrices. Therefore, the CRM selected for an analysis should be suitable for the type of samples. There are many aspects such as concentration range, matrix match, sample size, and uncertainty, which need to be considered when selecting a suitable CRM. Eventually, results of analysis of CRM were plotted into control charts in order to evaluate the quality of the data. This is to ensure that the results are within the 95% confidence interval as stipulated in the certificate of CRM. Thus, this article aims to discuss the uses of certified reference materials for quality control purposes in NAA involving various sample matrices.

Abstrak

Bahan rujukan piawai adalah berguna dalam kawalan mutu analisis dalam analisis pengaktifan neutron untuk memperolehi keputusan analisis yang boleh dipercayai. Ia juga penting dalam menilai keputusan kaedah NAA semasa menganalisa pelbagai bahan sampel. Oleh yang demikian, bahan rujukan piawai yang dipilih hendaklah bersesuaian dengan jenis sampel yang dikaji. Terdapat beberapa faktor yang perlu dipertimbangkan semasa memilih bahan rujukan piawai seperti julat kepekatan, kesesuaian matriks, saiz sampel, dan ketidakpastian. Keputusan analisis bahan rujukan piawai diplotkan dalam carta kawalan untuk menilai kualiti data. Ini adalah untuk memastikan keputusan adalah dalam lingkungan 95% confidence interval berbanding dengan sijek bahan rujukan piawai. Kertas kerja ini bertujuan untuk membincangkan kegunaan bahan rujukan piawai dalam kawalan mutu dalam analisis pengaktifan neutron yang melibatkan pelbagai jenis sampel.

Introduction

Chemical measurement requires data to be reliable in order to produce a correct interpretation when the data is used for specific purposes such as pollution studies, forensic science and human health. Therefore, the data from various chemical measurement techniques needs to go through analytical quality control measure. Eventually, certified reference materials (CRM) is used in the chemical measurement so as to improve the quality of the results. According to the ISO Guide 30, a CRM is defined as reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes its traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence [1]. There are many important uses of CRM namely for method validation, measurement uncertainty, verification of a method, instrumental calibration, quality control, traceability, and production of secondary reference materials [2].

In neutron activation analysis (NAA), CRM is an important part of the analytical procedure. This is because chemical measurement data requires proper analytical quality control in order to ensure the data is reliable and accurate. The CRM required for NAA can be obtained from institution around the world such as National Institute of Standards and Technology (NIST), and Institute for Reference Materials and Measurements (IRMM). These institutions produce CRM through a stringent protocol to properly characterize and determine the certified values of the CRM and certificate and report can be issued. The CRM produced are traceable to these institutions. However, much effort has been taken to ensure that the CRM produced from these institutions could produce a key link in the traceability chain [3]. Thus, utilizing CRM which has traceability to international standards will ensure that analytical results are reliable and comparable.