

Original Paper

Development and Validation of Method with Evaluation of Measurement Uncertainty for the Speciation Analysis of Chromium by Ion Chromatography

Swati, S. S. Tripathy , R. K. Saxena and P. K. Gupta

CSIR-National Physical Laboratory, K.S. Krishnan Marg, New Delhi, India

 S.S. Tripathy

Email: tripathyss@nplindia.org

Received: 15 June 2014 / **Accepted:** 18 December 2014 / **Published online:** 7 January 2015

Abstract

In the present study a simple, sensitive and accurate method has been developed for the speciation analysis of chromium(III) and chromium(VI) in aqueous solution using ion chromatography separation followed by detection through a UV detector. Chromium(III) was detected as its pyridine-2,6-dicarboxylic acid (PDCA) complex at 365 nm by prederivatizing it with eluent containing PDCA. Chromium(VI) was detected by post column derivatization with diphenylcarbazine at 540 nm. This paper discusses in details about the method validation and established each parameter according to the IUPAC and EURACHEM approaches. Method is validated for linearity, accuracy, precision, limit of detection and limit of quantification as per the guide lines. The evaluation of expanded uncertainty in measurement of Cr(III) and Cr(VI) was done at 95 % confidence level ($k = 2$) according to EURACHEM GUM guide. The method can be applied to determine Cr(III) and Cr(VI) up to 2 mg/kg and 40 $\mu\text{g}/\text{kg}$ respectively with associated measurement uncertainty value of about 5 %. The major contribution of uncertainty is due to recovery. The method described in the present study is sensitive, selective and capable of quantifying trace level of Cr(VI) and Cr(III).

Keywords

Chromium – Speciation – Method validation – Measurement uncertainty – IC