Estimation of Measurement Uncertainty for Total Chlorides Content Determination in Concentrated Solutions for Hemodialysis

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The uncertainty in measurement is a crucial segment of the estimation of experimental analytical results. Moreover, the results without an uncertainty estimation cannot be considered as complete. The aim of this work was an estimation of the combined standard and extended measurement uncertainty (MU) for three simple and rapid methods for routine determination of total chlorides content in concentrated solutions for hemodialysis. The first two methods were based on potentiometric titration, with minor differences in the sample preparation, while the third method was based on a simple volumetric titration. The approach applied for the MU estimation was according to the Guide for the expression of uncertainty in measurement[1].

The MU estimation was performed for the same sample with the three methods in order to test which one is the most precise. Based on the reproducibility data obtained from six repetitions it can be concluded that the first method was the most precise one, accompanied by lowest input of Type A uncertainty and confirmed by the MU value, as well. On the other hand, the volumetric method was found to be more precise than the second potentiometric method, based on the lower input of type A uncertainty. However, the uncertainty estimation showed that the potentiometric method was the one characterized by lower MU value, indicating that the volumetric method was associated with higher Type B uncertainty. Furthermore, the obtained results demonstrate that MU provides additional valuable information for the method performance and point out its importance in the interpretation of the obtained analytical results.

Keywords: total chlorides content, measurement uncertainty, potentiometric titration, volumetric titration.

References

1. JCGM 100:2008, Evaluation of measurement data–Guide to the expression of uncertainty in measurement; Joint Committee for Guides in Metrology: Sevrès, France, 2008.