Supelco®
Analytical Products

Application Note

Identification of matrix effects by means of dilution

This method is especially suited for samples where the analyte content lies in the upper half of the measuring range for the corresponding test kit.

Experimental Background

As a rule, a sample contains not only the substance to be analyzed (the analyte), but also further components (foreign substances, accompanying substances). Their interference can, under given circumstances, be so great that the recovery of the analyte deviates from 100% to a significant degree. For this reason, a variety of foreign substances have been investigated to define the concentration up to which they may be present in samples without their interfering with the determination in question. These limits are stated in the instruction for use of the Spectroquant®, Reflectoquant®, or MQuant® test kits, generally in the form of a table.

In the case of samples with a complex, in many cases inexactly known composition (matrix) - such as, for example, foods - it is particularly difficult to estimate the potential influence of the foreign substances on the analysis (matrix effect). The following instructions describe a method by means of which the user can test whether a matrix effect is present or not

Dilution method

In this method, a series of samples increasingly diluted with distilled water are prepared and

reflectometrically analyzed to determine and calculate the respective recovery rates of the analyte:

Step 1: Measurement of the undiluted sample (result **A** in mg/L)

Step 2: Measurement of the diluted sample (sample + distilled water) (result **B** in mg/L)

Step 3: Calculation of the recovery rate:

$$\text{Recovery rate} = \frac{\text{Result } \mathbf{B} \cdot \text{Dilution factor}}{\text{Result } \mathbf{A}} \cdot 100\%$$

The following table gives an overview of some dilutions commonly used in practice:

Sample solution [mL]	Distilled water [mL]	Dilution	Dilution factor	Final concentration [mg/L]
100	0	1+0 resp. 1:1	1	100
50	50	1+1 resp. 1:2	2	50
20	80	1+4 resp. 1:5	5	20
10	90	1+9 resp. 1:10	10	10
1	99	1+99 resp. 1:100	100	1

In order to securely determine matrix effects by means of dilution, the following aspects must be considered:

1. At least three different dilutions should be prepared.
2. The measurement values expected for the spiked solutions

Example

Measuring range of the test kit: 0.1 – 3.0 g/l

Result A [g/L]	Result B [g/L]	Dilution factor	Recovery rate
2.34	1.16	2	99%
	0.49	5	105%
	0.26	10	111%

Assessment of the results

A matrix effect is present when the recovery rate lies considerably below 80% or considerably above 120%. The decisive factor here is always the assessment of the measurement series as a whole. In the example above, therefore, a matrix effect can be excluded.

The presence of a matrix effect means that the sample in question cannot be properly investigated without appropriate pretreatment. Please check our available application notes whether the respective sample/analyte combination is already described or contact us.

For more information visit us at

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