Response/Calibration Factor

Definitions

Calibration Factor: A measure of the chromatographic response of a target analyte relative to the mass injected.

Response Factor: A measure of the relative mass spectral response of an analyte compared to its internal standard.

Ref: EPA R3 Quality Manual Rev 3 (1/12/04)

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Definitions-Cont.

Each calibration or response factor represents the slope of the line between the response for a given standard and the origin.

The average calibration factor or response factor of the standards for each analyte is then used to calculate the concentration of the sample.

Ref: EPA R3 Quality Manual Rev 3 (1/12/04)

Criteria

When the variation, measured as the relative standard deviation (RSD) of the factors, is less than or equal to 20%, then the slopes of the lines for each standard are sufficiently close to one another that the use of the linear model is generally appropriate *over the range of standards that are analyzed*.

Ref: SW-846, 8000C, Section 11.5.1

Criteria-Cont.

A relative standard deviation (RSD) of 25% or less is considered linear.

Ref: Protocol for EPA Approval of Alternate Test Procedures for Organic and Inorganic Analytes in Wastewater and Drinking Water, EPA-821-B-98-002, March 1999

Response/Calibration Factor Equations

External Standard Equation

$$CF = (A_x)/(C_x)$$

or

Internal Standard Equation

$$RF = ((A_x)(C_{is}))/((A_{is})(C_x))$$

Where:

A_x = Area of the compound

C_x = Concentration of the compound

A_{is} = Area of the internal standard

C_{is} = Concentration of the internal standard

Response/Calibration Factor Statistical Equations

Average RF or CF: $RF_{AVE} = (S\ RF_i / n)$

Standard Deviation (s): $s = \sqrt{\{ [S (RF_i - RF_{AVE})^2] / (n-1) \}}$

Relative Standard Deviation (RSD): $RSD = s / RF_{AVE} * 100$

Where:

- n = number of pairs of data
- RF_i = Response Factor for each level
- RF_{AVE} = Average of all the response factors
- S = the sum of all the individual values

In the equations above RF can be replaced with CF

Response/Calibration Factor Equations for Concentration

External Standard Equation

$$C_x = A_x / CF_{AVE}$$

or

Internal Standard Equation

$$C_x = ((A_x)*(C_{is})) / ((A_{is})*(RF_{AVE}))$$

Benefits

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2. Simple calculation.

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