CF and RRF

RF: - Response factor (or) Correction factor

Definition: -

Response factor is the ratio of the Peak area of the analyte for the concentration of analyte.

In general, concentration of an analyte is calculated in µg/ml (or) ppm.

In simple terms, speaking analytically, Response factor is the ratio of the area of the analyte and the concentration of the analyte

$$\boldsymbol{Response\ factor = \frac{Peak\ area\ of\ the\ analyte}{concentration\ of\ the\ analyte}}$$

RRF: - Relative response factor

Definition: -

Relative response factor is the ratio of the response factor of the impurity with the response factor of the Main Peak

$$\boldsymbol{Relative\ response\ factor = \frac{Response\ factor\ of\ the\ impurity}{Response\ factor\ of\ the\ Main\ peak}}$$

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For example,

Peak area of the impurity = 25000

Concentration of the impurity = 5ppm (µg/ml)

Peak area of the Main Peak = 75000

Concentration of the Main Peak = 25ppm (µg/ml)

Then the Response factor of the impurity can be calculated by using the formulae

$$\boldsymbol{Response\ factor\ of\ impurity = \frac{25000}{5} = 5000}$$

Then the Response factor of the Main Peak can be calculated by using the formulae

$$\boldsymbol{Response\ factor\ of\ Main\ Peak = \frac{75000}{25} = 3000}$$

Relative response factor of the impurity is calculated by using the following formulae

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$$\textbf{Relative response factor of the impurity} = \frac{5000}{3000} = 1.67$$

However, above mentioned formulae give the basic equation for the RRF, one must know the slopes for the impurity and its Main Peak to generate the RRF for an Impurity.,

Relative response factor calculated using the slope equation

$$\textbf{Relative response factor} = \frac{\textbf{Slope of the impurity}}{\textbf{Slope of the Main Peak}}$$

Slope of Impurity and Slope of API (main peak) are achieved by creating Linear graph from Linear Concentration of solutions vs area response.

By using slopes of Impurity and Main Peak., we could calculate Relative response factor by using above mentioned formulae.

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Linearity of Impurity		
Linearity Level	µg/ml (Conc)	Area response
LOQ (1%)	0.02	3590
10%	0.2	35897
25%	0.5	89744
50%	1	179487
75%	1.5	269231
100%	2	358974
150%	3	538461
200%	4	717948
Slope	179487.00	

Linearity of API (Main peak)		
Linearity Level	µg/ml (Conc)	Area response
LOQ (1%)	0.1	4585
10%	1	45846
25%	2.5	114614
50%	5	229229
75%	7.5	343843
100%	10	458457
150%	15	687686
200%	20	916914
Slope	45845.70	

RRF of Impurity	179487.00	3.92
	45845.70	

Usage of RRF in chromatographic analysis: -

By using the Relative Response factor, we could calculate Percentage of Impurity for the given substance: -

$$\textbf{Percentage of Impurity} = \frac{\textbf{Percentage of Chromatographic Impurity}(\%\ \textbf{Area})}{\textbf{Relative response factor of Impurity}}$$

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Calculation of %Impurity by applying RRF				
Peak	Area (µV)	Area (%)	RRF	%Impurity
Impurity-1	20145	0.078	0.56	0.14
Impurity-2	147159	0.568	1.15	0.49
Main Peak	25684567	99.217	-	-
Impurity-3	35514	0.137	1.00	0.14
Total Area of all Peaks	25887385		Total Impurities	0.77

% Impurity	%Area
	RRF