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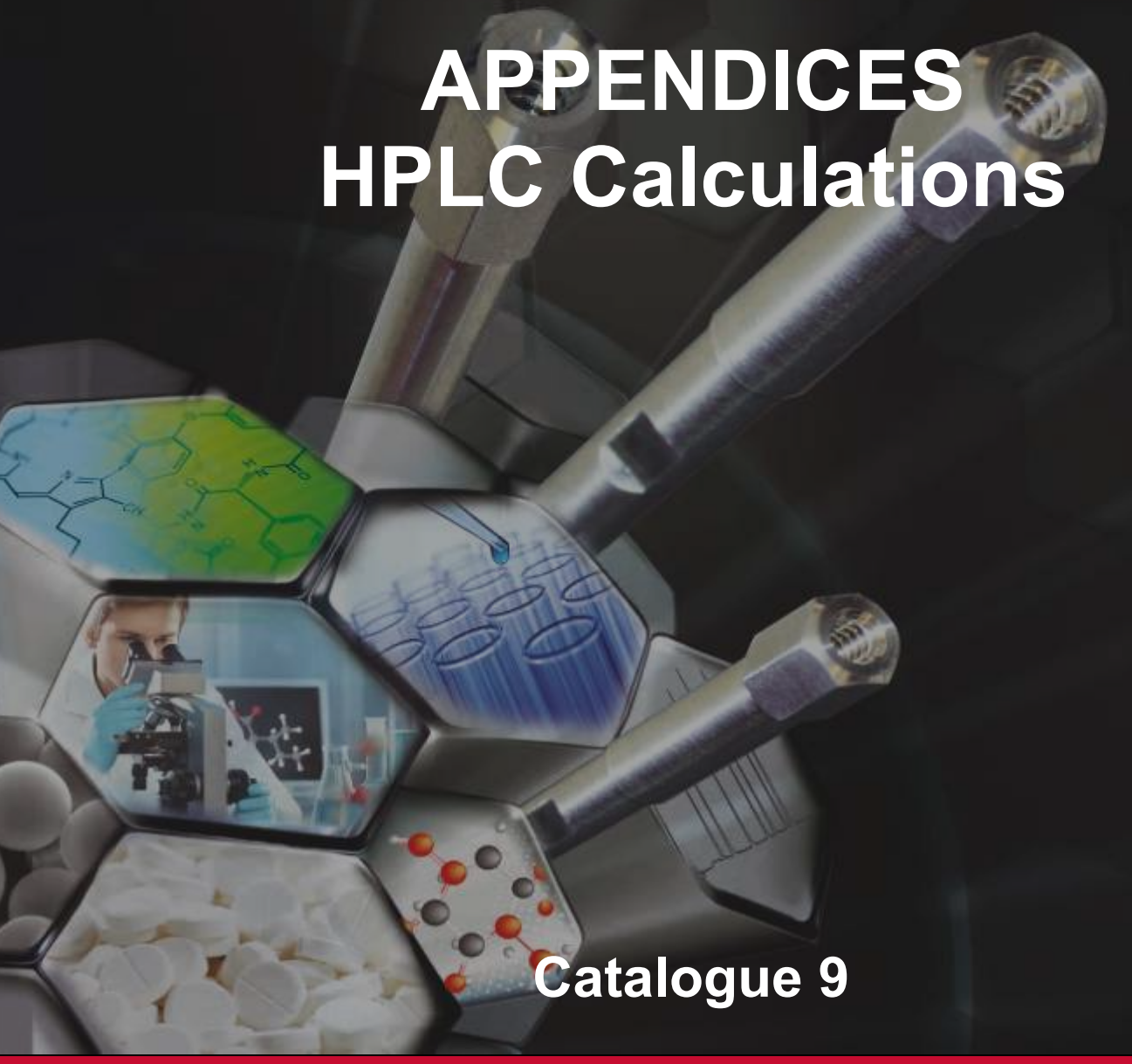
Chromatography Columns and Supplies

APPENDICES
HPLC Calculations



Catalogue 9

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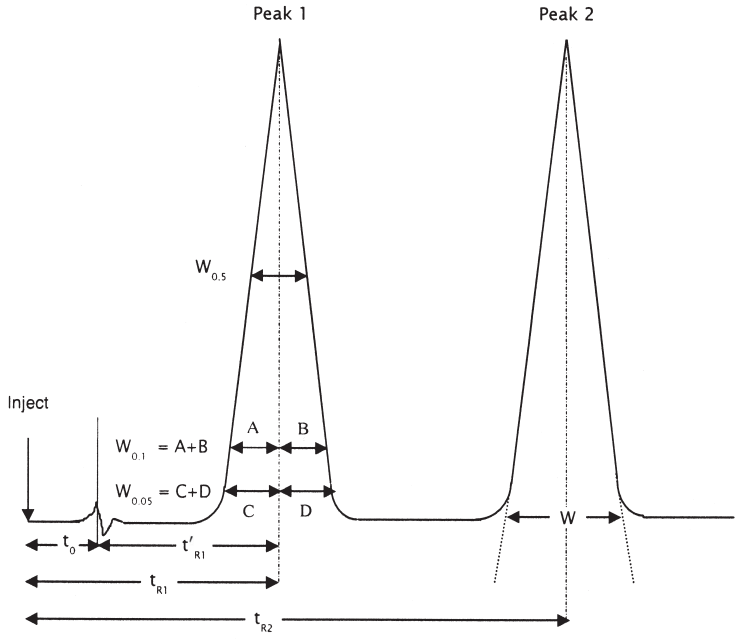
HPLC CALCULATIONS



where:

t_0 = Retention time of unretained peak
t_{R1} = Retention time of component 1
t_{R2} = Retention time of component 2
$w_{0.5}$ = Peak width at 50% peak height
$w_{0.1}$ = Peak width at 10% peak height
$w_{0.05}$ = Peak width at 5% peak height
w = Peak width at base
A = Peak front distance at 10% of peak height
B = Peak tail distance at 10% of peak height
C = Peak front distance at 5% of peak height
D = Peak tail distance at 5% of peak height

The following equations are based on the terms defined above.

Adjusted (net) Retention Time (t'_R)

$$t'_{R1} = t_{R1} - t_0$$

Selectivity

Retention Factor (k)

$$k = \frac{t_R - t_0}{t_0} = \frac{t'_R}{t_0}$$

Separation Factor (α)

$$\alpha = \frac{k_2}{k_1}$$

Performance

Column Efficiency (N)
(plate number or number of theoretical plates)

$$N_{0.5} = 5.54\left(\frac{t_R}{w_{0.5}}\right)^2 \text{ or } N_{0.1} = 18.55\left(\frac{t_R}{w_{0.1}}\right)^2$$

Height Equivalent to a Theoretical Plate (HETP)

$$H = \frac{L}{N}$$

where L = length of column

Reduced Plate Height (h)

$$h = \frac{H}{dp}$$

where dp = average particle diameter

Peak Shape

Asymmetry Factors (see p.14)

$$As_1 = \frac{N_{0.1}}{N_{0.5}} \qquad As_2 = \frac{B}{A}$$

USP Tailing Factor

$$T = \frac{w_{0.05}}{2C}$$

Resolution

$$R_s = 2\left(\frac{t_{R2} - t_{R1}}{w_1 + w_2}\right)$$

or

$$R_s = \frac{\sqrt{N}}{4}\left(\frac{\alpha - 1}{\alpha}\right)\left(\frac{k}{k+1}\right)$$

where k is the average retention factor for peaks 1 and 2