Mobile Phase Viscosity (η)

The viscosity of the mobile phase at the temperature of the chromatographic bed.

Inlet Pressure (p_i)

The *absolute* pressure at the inlet of a chromatographic column.

Outlet Pressure (p_o)

The absolute pressure at the exit of a chromatographic column. It is usually but not necessarily equal to the *Ambient Pressure* (p_a), the atmospheric pressure outside the chromatographic system.

Pressure Drop (Δp)

The difference between the inlet and outlet pressures:

$$\Delta p = p_i - p_o$$

Relative Pressure (P)

The ratio of the inlet and outlet pressures:

$$P = p_i / p_o$$

Mobile Phase Compressibility Correction Factor (j)

A factor, applying to a homogeneously filled column of uniform diameter, that corrects for the compressibility of the mobile phase in the column. It is also called the *Compressibility Correction Factor*. In gas chromatography, the correction factor can be calculated as:

$$j = \frac{3}{2} \frac{p^2 - 1}{p^3 - 1} = \frac{3}{2} \frac{(p_i / p_o)^2 - 1}{(p_i / p_o)^3 - 1}$$

In liquid chromatography the compressibility of the mobile phase is negligible.

Note: In former nomenclatures the term "pressure gradient correction factor" was sometimes used to express the same term. This is, however, an incorrect name, because it is not the pressure gradient but the compression of the mobile phase which necessitates the use of this factor. In liquid chromatography, where mobile phase compression is

negligible, no correction factor has to be applied to the mobile phase velocity; however, there is still a pressure gradient along the column.

Flow Rate

The volume of mobile phase passing through the column in unit time. The flow rate is usually measured at column outlet, at ambient pressure (p_a) and temperature (T_a, in K); this value is indicated with the symbol F. If a water-containing flowmeter was used for the measurement (e.g., the so-called soap bubble flowmeter) then F must be corrected to dry gas conditions in order to obtain the *Mobile Phase Flow Rate at Ambient Temperature* (F_a):

$$F_a = F(1 - p_w / p_a)$$

where p_w is the partial pressure of water vapor at ambient temperature.

In order to specify chromatographic conditions in column chromatography, the flow-rate (*Mobile Phase Flow Rate at Column Temperature*, F_c) must be expressed at T_c (kelvin), the column temperature:

$$F_c = F_a(T_c / T_a)$$

Mobile-Phase Velocity (u)

The linear velocity of the mobile phase across the average cross-section of the chromatographic bed or column. It can be calculated from the column flow-rate at column temperature (F_c), the cross-sectional area of the column (A_c) and the interparticle porosity (ε):

$$u = F_c /(\varepsilon A_c)$$

In practice the mobile phase velocity is usually calculated by dividing the column length (L) by the retention time of an unretained compound (t_M; see *Hold-up Volume (Time)*):

$$u = L/t_M$$

In gas chromatography, due to the compressibility of the carrier gas, the linear velocity will be different at different longitudinal positions in the column. Therefore two terms must be distinguished:

The *Carrier Gas Velocity at Column Outlet* (u_o) can be obtained as above, from the carrier gas flow rate measured at column outlet:

$$u_o = F_c /(\varepsilon A_c)$$

The *Average Linear Carrier Gas Velocity* ($\bar{u}$) is obtained from u_o, by correcting it for gas compressibility:

$$\bar{u} = u_o j$$

The average linear carrier gas velocity can also be obtained by dividing column length (L) by the retention time of an unretained compound (t_M):

$$\bar{u} = L/t_M$$

In liquid chromatography where mobile phase compression is negligible, $\bar{u} = u$.

Reduced Mobile Phase Velocity (v)

A term used mainly in liquid chromatography. It compares the mobile phase velocity with the velocity of diffusion into the pores of the particles (the so-called diffusion velocity, u_D: see *Diffusion Velocity*):

$$v = \bar{u}/\bar{u}_D = \bar{u}\, d_p/D_M$$

In open-tubular chromatography:

$$v = \bar{u} \cdot d_c /D_M$$