9.2.6.2 Retention Parameters

Retention Volume (Time) of an Unretained Compound (V_o, t_o)

The retention volume of a sample component the molecules of which are larger than the largest pores of the gel particles. These will be eluted first from the column. The corresponding retention time is t_o:

$$t_o = V_o / F_c$$

Ignoring any extra-column volume, V_o is equal to the *Interparticle Volume of the Column*.

Retention Volume (**Time**) V_R (t_R)

The retention volume (time) of a sample component the molecules of which are smaller than the largest pores of the gel particles but larger than the smallest pores. The corresponding retention time is t_R:

$$t_R = V_R / F_c$$

Adjusted Retention Volume (**Time**) V_R' (t_R')

The total retention volume less the retention volume of an unretained compound:

$$V_R' = V_R - V_o$$

The corresponding retention time is t_R':

$$t_R' = t_R - t_o = V_R' / F_c = (V_R - V_o) / F_c$$

Total Mobile Phase Volume (**Time**) V_t (t_t)

The retention volume (time) of a sample component the molecules of which are smaller than the smallest pores of the gel particles. The corresponding retention time is t_t:

$$t_t = V_t / F_c$$

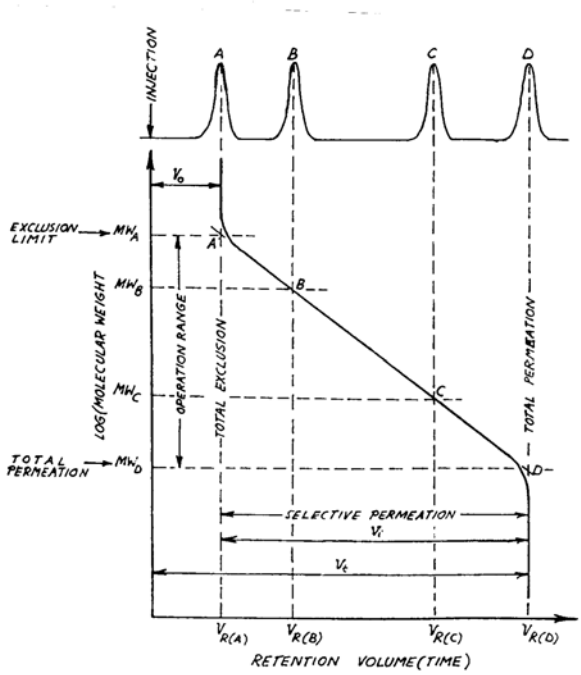

Figure 9.2.7 Retention characteristics in exclusion chromatography. A standard sample is analyzed (top); subsequently, the retention volumes (times) are plotted against the logarithms of the corresponding molecular weights. Peak A corresponds to a non-retained sample component the molecules of which are larger than the largest pores in the gel particles (total exclusion); peak D corresponds to a sample component the molecules of which are smaller than the smallest pores in the gel particles (total penetration).

Retention Factor (k_e)

The ratio of the adjusted retention volume (time) and the retention volume (time) of an unretained compound:

$$k_e = \frac{V_R - V_o}{V_o} = \frac{t_R - t_o}{t_o}$$

It may also be called the *Capacity Factor*. However, the suggested expression better defines its real meaning (see also *Retention Factor*).

Distribution Constant in Exclusion Chromatography (K_o)

The fraction of the intraparticle volume (the volume of the pores) available to the molecules of a particular sample component for diffusion:

$$K_o = \frac{V_R - V_o}{V_i}$$

For an unretained compound, $V_R = V_o$ and thus, $K_o = 0$. On the other hand, for a compound the molecules of which are smaller than the smallest pores, $V_R = V_t$ and thus, $K_o = 1$. In other words, the value of K_o varies between zero and unity.

In exclusion chromatography, K_o is related to the retention volume of a sample component and the inter- and intraparticle volumes of the column (V_o and V_i, respectively) in a manner analogous to the relationship in general liquid chromatography (see *Distribution Constant*):

$$V_R = V_o + K_o V_i$$