retention factor (in column chromatography), k

A measure of the time the sample component resides in the stationary phase relative to the time it resides in the mobile phase; it expresses how much longer a sample component is retarded by the stationary phase than it would take to travel through the column with the velocity of the mobile phase. Mathematically, it is the ratio of the *adjusted retention volume* (time) and the *hold-up volume* (time):

$$k = V'_R / V_M = t'_R / t_M$$

If the *distribution constant* is independent of sample component concentration, then the retention factor is also equal to the ratio of the amounts of a sample component in the stationary and mobile phases respectively, at equilibrium:

$$k = \frac{\text{amount of component in stationary phase}}{\text{amount of component in mobile phase}}$$

If the fraction of the sample component in the mobile phase is R, then the fraction in the stationary phase is $(1 - R)$; thus

$$k = (1 - R)/R$$

In former nomenclatures and in the literature one may find the expressions partition ratio, capacity ratio, capacity factor or mass distribution ratio to describe this term.

In the literature the symbol k' is often used for the retention factor, particularly in liquid chromatography. The original reason for this was to clearly distinguish it from the partition coefficient (distribution constant) for which the symbol K had been utilized. Since, however, the distribution constants are all identified with a subscript, there is no reason to add the prime sign to this symbol. It should be emphasized that all the recognized nomenclatures (IUPAC, BS, ASTM) have always clearly identified the capacity factor with the symbol k and not k'.

The logarithm of the retention factor is equivalent to the R_M value used in planar chromatography. The symbol κ is suggested to express log k:

$$\kappa = \log k = \log [(1 - R)/R]$$

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