Thesis Title Variation of column efficiency with compounds in the same homologous series

Thesis Credits 12 credits

Candidate Miss Wanida Wongsumpanchai

Supervisors Assc. Prof. Dr. Kanit Krisanangkura

Asst. Prof. Narumon Jeyashoke

Degree of Study Master of Science

Department Biotechnology

Academic Year 1998

Abstract

Gas chromatography is the separation methods and column efficiency can be determined by the following equation:

$$N = 16t_r^2/w^2$$

or $$H = (L.w^2)/(16.t_r^2)$$

where N is the number of theoretical plate, H is the height equivalent to a theoretical plate, t_r is the retention time of the test substance, w is the idealized width of the peak at the base line and L is the column length. The higher N values is the better column efficiency, but the higher H values indicates lower column efficiency. Hence they are inversely related. Further more, H and TZ are related as follow:

$$TZ = [(L/16)^{1/2}.(t_r^b-t_r^a)/(t_r^bH_b^{1/2}+t_r^aH_a^{1/2})]-1$$

where TZ is the separation number. t_r^a and t_r^b are retention times of an homologous series differing by one methylene unit and $H_a^{1/2}$ and $H_b^{1/2}$ are height equivalent to a theoretical plate of homologous differing by one methylene unit.

In this study, the optimal flow rates of carrier gas and H_{min} at various column temperatures were determined by linearization of the Golay's equation. Plate numbers are greater for the smaller molecules in the same homologous series. H and TZ are inversely related. The H_{min} and flow optimum calculated by various methods show good agreement between experimental results and calculated values.

Keywords: Carbon number / Gas chromatography / Height equivalent to a theoretical plate / Hydrocarbons / Plate number / Retention time / Separation number