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New Retention Model of Langmuir Adsorption in RP-HPLC

Ju Weon Lee, Myoung Seup So, Youn-Woo Lee*, Sung Taik Chung, Kyung Ho Row

Department of Chemical Engineering, Inha University,
253 Yonghyun-Dong, Nam-Ku, Inchon 402-751, Korea

*CFC Alternatives Technology Center, Korea Institute of Science and Technology,
P.O. Box 131, Cheongryang, Seoul, Korea

환경/생물

As high performance liquid chromatography (HPLC) is wildly used as a standard analytical instrument, a number of stationary phases are commercially available. HPLC columns are improved to increase the selectivity and the efficiency for the mixtures separated. The most commonly used technique is reversed-phase high performance liquid chromatography (RP-HPLC), which is usually done by n-octadecyl modified packings. As the C_{18} are chemically bonded to the surface of the particle, these packings provide stability and reproducibility as well as selectivity.(1)

Normally, the prediction of retention time is based on some expected dependences of capacity factor on mobile phase composition. Retention volume may be expressed as retention time at constant flow rate of mobile phase. More often it is discussed in literature a problem of the extrapolation of experimental data to estimate the value of capacity factor for water as mobile phase.

For RP-HPLC column, the major constituent is highly polar solvent (e.g. water), and the less polar solvent of organic modifiers (e.g. methanol, acetonitrile, etc.) are added to control the hydrophobic nature between solute and C_{18}-coated stationary phase. Snyder relationship has been typically used to describe the relationship between capacity factor and the fraction of mobile phase.(2) But recently, the more elaborate equation based on the adsorption of Langmuir adsorption shows better prediction of capacity factor with different composition of mobile phase.(3) For the nitro and steroid samples as well as the solutes of deoxyribonucleosides, five retention models including the Langmuir-type retention model were compared with the experimental data.

The volume fraction of organic modifier was changed from 0.05 to 0.30, and to 0.12 for methanol and acetonitrile, respectively. The Langmuir-type retention model with two parameters shows excellect agreements between the experimental capacity factors and calculated values although the values by the log-scale quadratic model with three parameters are closer. Unlike the other four retention models, the slope of the Langmuir-type retention model can characterize the properties of solute and organic modifier simultaneously. For each solute, the intercepts calculated for acetonitrile and methanol as organic modifiers are coincident closely.

References

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