What are theoretical plates and HETP in HPLC – Primer

The chromatographic process is comprised of a continuous series of equilibria in which the solute is interacting either with the mobile phase or the stationary phase.

These interactions may be approximated as a finite, statistically significant number of regions throughout the column's length, which for historical reasons are called "plates." The terms itself comes from early applications with distillation columns. The greater the number of these hypothetical regions, the more equilibria processes can be said to have occurred, and hence the more "efficient" the column at performing chromatography. Therefore, the number of theoretical plates (usually abbreviated as N) can be used as a measure of the performance characteristics of the column.

In addition to the number of these theoretical plates, you can also consider the length of one plate region as a means of comparing column performance characteristics. Because early chromatography columns were carried out by gravity instead of pressure and hence were arranged vertically, the length of one such hypothetical region is called the "plate height," H.

It can also be called the "Height Equivalent of a Theoretical Plate," or HETP. You can imagine if you have more theoretical plates for two columns of the same total length, the length of each plate will be smaller. Hence, the highest efficiency columns will have the lowest HETP.

Chromatographers usually plot HETP as a function of linear flow rate and look for the minimum to see what the best flow rate would be to use, referred to as a "Van Deemter plot."

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