Do Tanaka Plots for HPLC apply to columns used with Aqueous Normal Phase ANP methods - FAQ

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Short Answer: No. While Tanaka plots are a valuable tool for characterizing Reversed Phase (RP) columns, they are not applicable to columns used in Aqueous Normal Phase (ANP) or Hydrophilic Interaction Liquid Chromatography (HILIC) methods.

🧠 What Is a Tanaka Plot?

Developed by Nobuo Tanaka et al., the Tanaka test suite is a standardized set of chromatographic evaluations designed to probe the selectivity characteristics of RP stationary phases. The method involves separating a defined set of analytes under controlled conditions and interpreting the results to assess:

- Hydrophobicity
- Shape selectivity
- Ion-exchange capacity
- Hydrogen bonding interactions

For example, the triphenylene vs. o-terphenyl separation is used to evaluate shape selectivity, as both compounds are similar in hydrophobicity but differ structurally.

⚠️ Why Tanaka Plots Don't Translate to ANP or HILIC

Tanaka plots are inherently based on RP retention mechanisms, which rely on hydrophobic interactions between analytes and the stationary phase. In contrast:

- ANP and HILIC methods operate under polar retention mechanisms, where partitioning, hydrogen bonding, and electrostatic interactions dominate.
- The analyte set and mobile phase conditions used in Tanaka testing are not representative of the retention behavior observed in ANP or HILIC.

As a result, applying Tanaka-derived metrics to ANP columns would yield misleading or irrelevant conclusions.

🔍 Additional Insight

For ANP or HILIC column evaluation, consider alternative characterization strategies such as:

- Retention mapping using polar probe analytes
- Selectivity profiling under varying water/acetonitrile gradients
- Zwitterionic vs. neutral analyte behavior to assess electrostatic contributions

These approaches provide a more accurate picture of column performance under aqueous-polar conditions.

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