Understanding Some of the Differences Between HILIC Columns and ANP Columns - Tips & Suggestions

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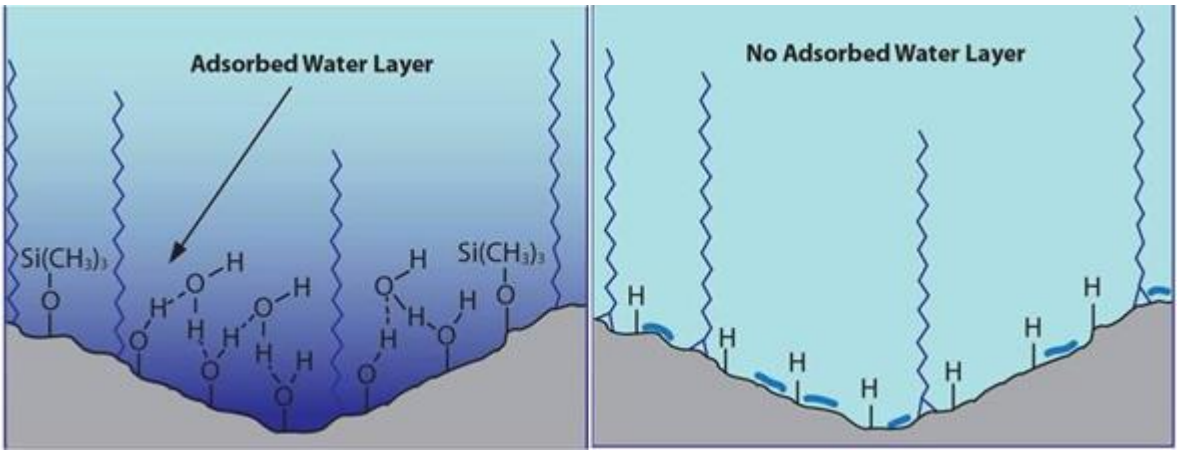
There are significant differences between HILIC columns and Cogent TYPE-C™ Silica Hydride columns, though both can separate polar compounds. Here are the key points:

Similarities:
Both HILIC and Cogent TYPE-C™ columns retain polar compounds when using mobile phases with high organic content (>70%). Each operates on principles related to normal-phase chromatography—HILIC is classified as “Hydrophilic Interaction Chromatography,” while Cogent columns use **Aqueous Normal Phase (ANP)**. Both can retain analytes that reversed-phase columns cannot.

Differences:

- **Stationary Phase Polarity:** HILIC phases are highly polar, whereas TYPE-C™ phases are relatively non-polar.
- **Retention Profile:** HILIC columns do not retain non-polar compounds, while Cogent columns can retain both polar and many non-polar compounds—sometimes in the same gradient or isocratic run.
- **Mechanism:**
  - HILIC relies on a **hydration layer** on the silica surface. Polar analytes partition into this layer and interact with silanols beneath it. This requires careful equilibration for reproducibility.
  - Cogent TYPE-C™ columns lack significant silanols and hydration shells. Retention of polar compounds occurs via adsorption on the silica hydride surface, while bonded phases allow non-polar retention. This design enables **rapid equilibration** and fast gradient changes.
- **Versatility:** HILIC columns are limited to HILIC mode. Cogent TYPE-C™ columns can switch seamlessly between **ANP, RP, and traditional Normal Phase** (using non-polar solvents like hexane) without hysteresis.

This flexibility makes Cogent TYPE-C™ columns uniquely efficient for complex separations. Additional features and benefits are detailed in other Knowledge Base article s.



HILIC Phases have a Water Shell Cogent TYPE-C Silica has no Water Shell

See also: Comparison of the efficiency in ANP vs. HILIC.
See also: Wikipedia definition of ANP
See also: ANP v. HILIC Advantages

A very popular journal article on this subject:

Journal of Chromatography A, E. Barto, A. Felinger & P. Jandera Investigation of the temperature dependence of water adsorption on silica-based stationary phases in hydrophilic interaction liquid chromatography, 2017, Volume 1489 pages 143-149

COGENT HPLC Columns™

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MicroSolv Technology Corporation
9158 Industrial Blvd. NE, Leland, NC 28451
Tel: (732) 380-8900
Fax: (910) 769-9435
Email: customers@mtc-usa.com
Website: www.mtc-usa.com