Abstract
We have recently developed a series of novel carbon-modified porous silica materials for use in analytical and preparative separations, and as solid-phase extraction media. The analytical materials exhibit unique characteristics compared to other commercially available carbon phases as they are substantially more stable at high pressures and exhibit acceptable mass transfer characteristics. Users of carbon-based phases are aware that some compounds are very difficult to elute from existing commercial carbon-based materials. The new materials described here will show good peak shape and acceptable mass transfer characteristics. Users of carbon-based phases are aware that some compounds are very difficult to elute from existing commercial carbon-based materials. The new materials described here will show good peak shape and acceptable mass transfer characteristics.

Commercially Available Carbon-Based Materials

Existing
Pure Carbon, also known as: Porous Graphitic Carbon® (PDGC, CCB), Hypercarb™

Carbon on Zirconia, also known as: ZirChrom-CARB™

New
Carbon on Silica, referred to as COS

*We also note that Carr and coworkers have described the preparation of a material beginning with porous silica, followed by deposition of a thin layer of aluminum, and finally carbon modification by a CVD process.

Analytical Materials – Basic RPLC Behavior (COS)

<table>
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<tr>
<th>Peak Shape</th>
<th>Dynamics</th>
<th>Reversed-Phase Retention</th>
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<tr>
<td>For van Deemter fit, A = 1.91±0.09, B = 3.56±0.08, C = 0.09±0.004</td>
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LC Conditions: 50 x 4.6 mm i.d. column (~17% carbon, w/w); 15/85 ACN/water (except LSST data); Temperature, 40°C

Chromatographic Selectivity for Ionizable Compounds

Different RP Selectivity is Useful for 2DLC Separations (Selectivity for Nine Opiates)

Conclusions
- Carbon phases based on silica substrates (COS) show tremendous potential for analytical liquid chromatography applications.
- COS materials exhibit characteristic carbon selectivities over a very wide range of carbon load.
- The inertness of the silica substrate for the COS materials allows the analysis of strong Lewis bases, even under LC/MS-friendly conditions.
- COS phases exhibit selectivities for ionizable and polar compounds that are highly complementary to typical reversed-phase selectivities, and are useful in two-dimensional HPLC separations.

References

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