

## CHEMISTRY Departmental Seminar

Spring 2019  
 CHEM 285/191 Schedule  
 Tuesday at 4:30-5:45PM  
 Room Duncan Hall 250

May 7<sup>th</sup>, 2019

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 MS Final Oral Seminar

### ***Synthesis and Evaluation of Novel Silica Hydride-based Stationary Phases for Bioanalytical Applications***

Most HPLC columns are packed with silanol-rich (Si-OH) type-B silica material that often participates in undesired electrostatic interactions with the analyte solutes and produces poor peak shape <sup>[1,2]</sup>. These silanols are also known to facilitate surface hydration necessary for HILIC retention mode for polar analyte molecules. However, the hydrated surface composition can easily fluctuate, and thus results in a poor reproducibility and requires lengthy equilibration step. In this study, four novel stationary phases have been developed by using the TYPE-C™ Silica Hydride material, which has replaced up to 95% of the surface silanols with silicon-hydride (Si-H) groups. One of the advantages of this material is the ability to retain polar molecules by operating in adsorption-based aqueous normal phase (ANP) mode, despite of the surface coverage by hydrophobic Si-H group <sup>[4]</sup>. Overall, TYPE-C™ materials eliminate most of the drawbacks observed in the earlier forms of silica. The objectives of this study are three-fold: (1) to develop novel hydride-based columns by surface functionalization, (2) to evaluate the general chromatographic performances and analyte selectivity by HPLC-DAD and ESI-TOF-MS instrumentation, and (3) to explore new bioanalytical applications of the silica hydride stationary phases and ANP chromatography. Here, practical applications of the novel hydride-based columns were demonstrated in several research projects. The following topics are discussed in this seminar: the analysis of cannabinoids along with other psychoactive-substances<sup>[5]</sup>, metabolomics characterization of the USDA grape cultivars, and method development for the ANP-coupled HDX-MS assay which will be used in the future structural proteomics studies.

#### References:

- 1 Snyder, L. S.; Kirkland, J. J.; Glajch, J. L. Practical HPLC Method Development, 2nd ed. *New York: John Wiley & Sons, 1997.*
- 2 Brown, L.; Ciccone, B.; Pesek, J. J.; Matyska, M. T. An Evolution in Separation Media for HPLC. *American Lab.* **2003**, 35 (24), 23-29.
- 3 Sandoval, J. E.; Pesek, J. J. Hydrolytically Stable Bonded Chromatographic Phases Prepared through Hydrosilylation of Olefins on a Hydride-Modified Silica Intermediate. *Anal. Chem.* **1991**, 63 (22), 2634-2641.
- 4 Pesek, J. J.; Matyska, M. T. A Comparison of Two Separation Modes: HILIC and Aqueous Normal Phase Chromatography. *LCGC North America.* **2007**, 25 (5), 480-490.
- 5 Watanabe, S., Santos, T. Q., Matyska-Pesek, M. T., & Pesek, J. J. Evaluating novel silica hydride-based stationary phases for the analysis of phytocannabinoids and other psychoactive drugs. *Journal of Separation Science.* **2019.**

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