CHEMISTRY Departmental Seminar

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

May 7th, 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 \cite{1,2}. 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 \cite{4}. 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\cite{5}, 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:

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