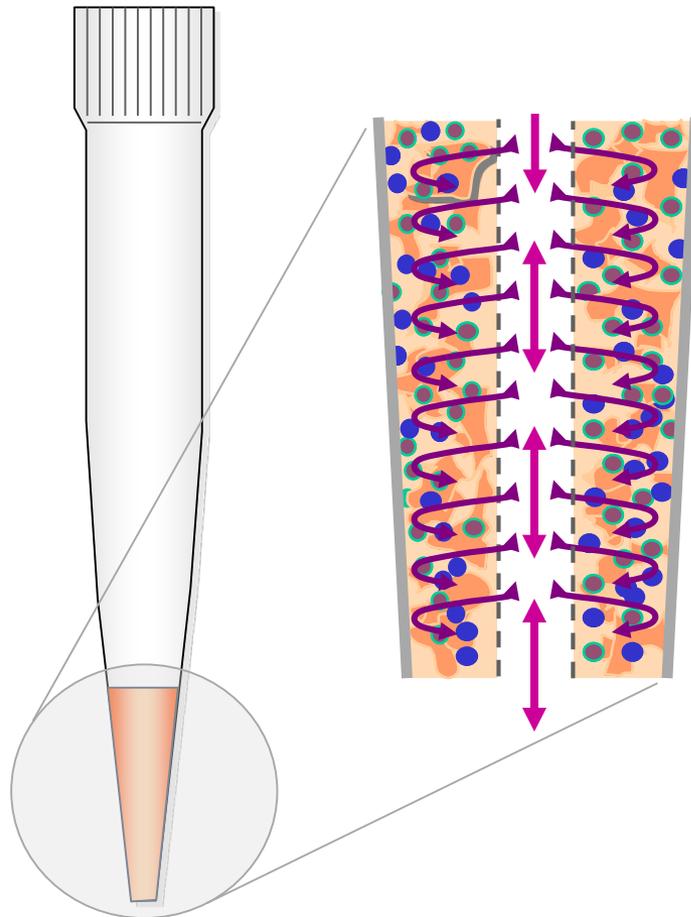


## Synthesis of new materials for enrichment and separation technologies, e.g. chromatography, electrophoresis, mass spectrometry

The Institute of Analytical Chemistry and Radiochemistry has a long lasting experience on the synthesis and application stationary phases for the separation of biological samples. Main focus is placed on the development of organic monolithic stationary phases, especially in capillary size. Monolithic stationary phases exhibit a number of crucial advantages compared to their particulate counterparts, regarding the ease of preparation, pH stability as well as their chromatographic characteristics in terms of support permeability, reduced mass transfer restriction by convention and diminishment of interparticulate void volumes. Due to their continuous interconnected skeleton structure with large through-pores organic monoliths offer high permeability resulting in excellent separation efficiency. The possibility to adjust the meso- and macro-porosity of monolithic stationary phases allows performing studies in proteomics as well as metabolomics. This has led to the development of selective and sensitive chromatographic methods which are also hyphenated to mass spectrometry.

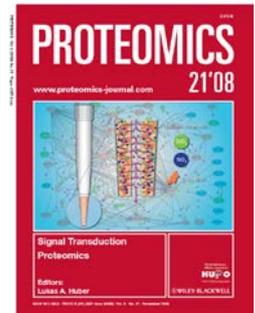
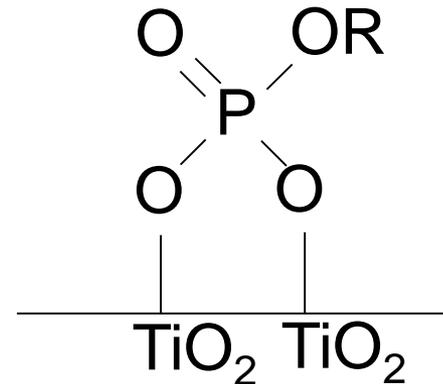
# Preparation of - Enrichment Technologies

## Example: Hollow-Monolith Tips



### Hollow Monolith™

-   $\text{ZrO}_2 < 100 \text{ nm}$
-   $\text{TiO}_2 < 100 \text{ nm}$
-  poly(divinylbenzene)



Mechanism: Bridging Bidentate

Rainer, M., Sonderegger, H., Bakry, R., Huck, C. W., Morandell, S., Huber, L. A., Gjerde, D. T. and Bonn, G. K. (2008), Analysis of protein phosphorylation by monolithic extraction columns based on poly(divinylbenzene) containing embedded titanium dioxide and zirconium dioxide nano-powders. *Proteomics*, 8: 4593–4602.

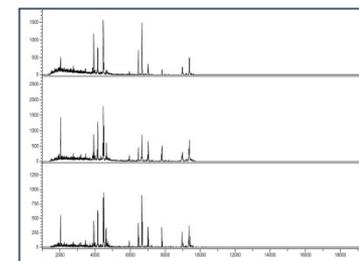
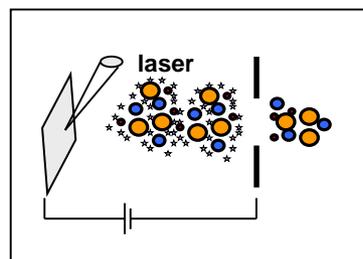
# Automation of Sample Preparation



## 1. sample loading 2. sample spotting



## 3. sample analysis 4. data processing

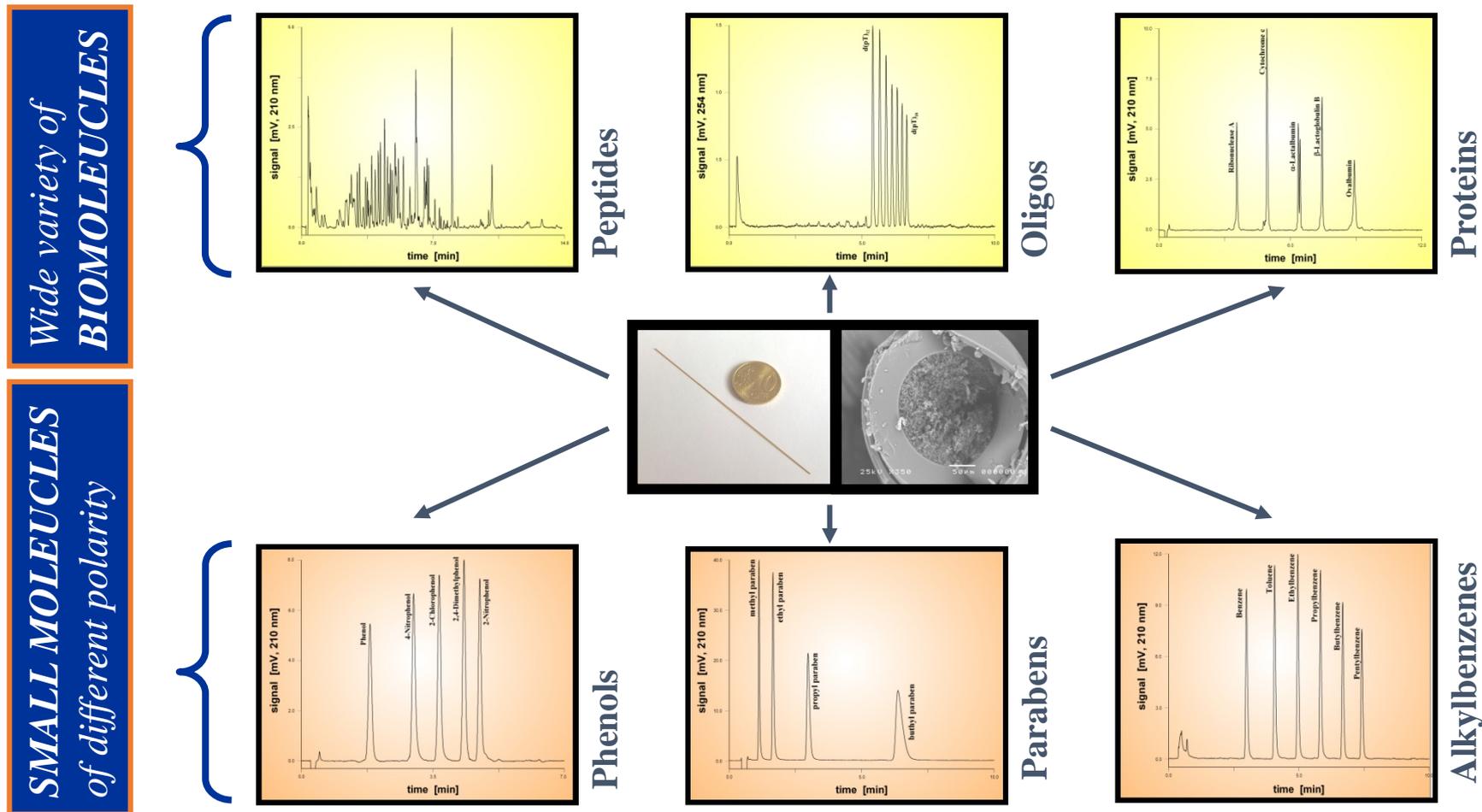


- Specific enrichment
- Purification
- Desalting

A collaboration with *PhyNexus Inc., San Jose, CA, USA*



# Synthesis of New Stationary Phases for Chromatography



→ Separation of biopolymers as well as small molecules of various polarity can be separated on the same monolithic capillary column

Bonn, G., Lubbad, S., & Trojer, L. (2005). U.S. Patent Application 11/316,970.

Schemeth, D., Rainer, M., Thalinger, R., Tessadri, R., & Bonn, G. K. (2014). *J. Chromatog. Sci*, 53(2), 331-337