Chemical Analysis With Monolithic Columns

Dr. Egidijus Machtejevas, Product Management Analytical Chromatography and Dr. Stephan Altmaier, Research and Development Analytical Chromatography, Merck Millipore

Chemical analysis of food is a prerequisite for ensuring correct labeling and protection of consumers against adulteration and misbranding. Nutritional data on packaged food are necessary for helping consumers choose food in accordance to their individual dietary needs. Accordingly, labeling regulations describe in detail the requirements for nutritional labeling (nutrients, amounts and caloric values) on food packages. To ensure a consistent nutrient declaration, the food manufacturer needs to perform additional testing for nutrients such as sugars, organic acids, sugar alcohols, fat and fatty acids, protein, and sodium, as well as for vitamins and minerals.

Measures for ensuring food safety, provision of wholesome food, and consumer protection against adulteration and misbranding require reliable data obtained by chemical analysis of food. Reliable analytical results are also essential to facilitate international food trade. In an attempt to provide a safer food supply, the FDA recently unveiled new, more stringent rules on imported foods. Under the new standards, importers must know whether supplying farms or processors are taking steps to eliminate risk.

In food analysis, complexity of the food matrix can have the largest impact on the performance and long term reliability of the analytical methods and procedures used. The food matrix consists mainly of chemical compounds including protein, carbohydrate and lipids, which can significantly affect the performance of analytical methods. For example, high-fat or high-sugar foods can cause different types of interferences compared to low-fat or low-sugar food [1].

Application of different sample preparation procedures, being a pre-condition for delivery of accurate analytical results, is often not only time-consuming, but sometimes leads to artifact formation as most of the errors come from sample preparation [2]. Therefore, analytical methods for food analysis always need to take into account the characteristics and composition of the specific food matrix which in general shorten the life time of the analytical column (in extreme cases only, one injection and the column is dead).

As such, there is an increasing need for new analytical methods able to cope with analytes in very complex matrices. These new analytical assays must provide sensitivity, robustness and high resolution within an acceptable analysis time. Many modern approaches in high pressure liquid chromatography (HPLC) analysis enable the reduction of the analysis time without compromise on resolution and/or separation efficiency including the use of monolith HPLC columns.

Monolithic columns are made of a single rod of high purity porous silica and are

substantially more matrix tolerant than particle packed columns of similar efficiency. The high permeability and porosity of the rigid silica skeleton result in low column backpressure and more flexibility in flow rates compared to particulate columns. Column equilibration after gradient elution is also much faster on monolithic columns than similar dimension particle packed columns. Overall this offers a possibility to perform high throughput analysis without losing separation efficiency or peak capacity.

Following, we provide examples of how monolithic columns can be used to accelerate time to results and help overcome the inherent challenges presented by analyzing molecules of interest in very complex matrices.

Keep reading here... [1]

Links:
[1] http://www.foodmanufacturing.com/articles/2013/12/use-monolithic-hplc-columns-food-analysis-complex-matrices