

Press Release: Ion chromatography: carbohydrate analysis in essential and non-essential foodstuffs

Date: 8th July 2011

The determination of carbohydrates or saccharides is of great interest in food analysis due to their importance as macronutrients. Metrohm has developed a straightforward ion chromatographic method using isocratic elution and pulsed amperometric detection (PAD) to sensitively determine water-soluble polyols and sugar alcohols as well as mono-, di- and oligosaccharides in essential and non-essential foodstuffs. The complete article can be downloaded here.



The most commonly applied analytical techniques for determining carbohydrates are H-nuclear magnetic resonance (NMR), fourier transform infrared spectroscopy (FT-IR), polyacrylamide gel electrophoresis (PAGE), gas and liquid chromatography (GC/LC) followed by mass spectrometry (MS). While spectroscopic methods require expensive instruments and highly skilled operators, gas chromatography methods necessitate time-consuming derivatizations. High-performance anion-exchange chromatography provides an alternative that is both less expensive than MS and faster than GC.

In strongly alkaline mobile phases, sugar anions are separated on a positively charged strong anion-exchange resin. Subtle differences in the pKa values of the carbohydrate hydroxyl groups allow efficient separation of low-molecular saccharides. However, sensitive and straightforward detection of the separated carbohydrates has long been a challenge. Ultraviolet and fluorescence detectors cannot be used due to the lack of chromophores and fluorophores, and refractive index detection suffers from poor sensitivity and the fact that gradient elution is not applicable.

Since carbohydrates are electrochemically active, amperometric detection overcomes these problems. A triple-step potential waveform referred to as pulsed amperometric detection (PAD) is applied. Initially a positive potential (E1) is applied to determine the target analytes, followed by the application of a second, more positive potential (E2) for oxidative removal of any reaction products from the electrode surface. The third, negative potential (E3) is employed to reduce any surface oxide on the electrode surface. The entire three-stage process typically lasts one second and is repeated once per second to prevent electrode fouling. Apart from carbohydrates, PAD has proven to be effective for amino sugars, amino acids, biogenic amines, sulphur-containing species, alcohols and some antibiotics.

For more information on this press release please contact the Marketing Department at Metrohm UK Ltd.

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Note to Editors:

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