JH Analytik - Information

ItaChrom II-M Isotachophoresis System

JH Analytik

Robert-Bosch-Strasse 83
D-73431 Aalen

Tel.: +49 (0)7361 9918 22
Fax: +49 (0)7361 9281-12

ISOTACHOPHORESIS

Separations of ionic compounds either can be done with chromatographic or electrophoretic techniques.

In contrast to chromatographic techniques which manage the separation by the analytes´ different distributions between a stationary and a mobile phase, electrophoresis works with an applied electric field separating the analytes according to their electrophoretic mobilities.

Isotachophoresis (ITP) uses a non-continuous electrolyte system, consisting of leading and terminating electrolyte.
Usually ITP is operated with capillaries showing inner diameters of 200 - 300 µm.

Simple System design

Compared to chromatographic techniques Isotachophoresis generally requires a simpler system design showing low abrasion due to the absence of moving parts.

Low Chemical Consumption

Due to the absence of a flow – customary with other methods - electrolyte consumption is limited to re-filling of the capillaries after each run. Furthermore only aqueous solutions are used which saves disposal costs and also holds ecological advantages.

No Sample Preparation

In chromatographic techniques the flow of the mobile phase always transports the entire matrix over the separation path.
Since Isotachophoresis works in a hydrodynamically closed system uncharged matrix components are not migrating in the applied electric field and are remaining in the injection valve of the instrument.
Due to the innovative column-coupling-technique the ItaChrom-series-instruments offer the possibility to cut-off charged excess-components in the first column before analysis takes place in the second column.

Most samples either can be injected directly or after a simple dilution step. Therefore expensive and time-consuming sample preparation steps are not required.

Fast Method Development

Variation of the electrolyte-pH value offers the easiest and most effective possibility to attain optimum separation conditions. Conditioning times are practically negligible in Isotachophoresis.

Manual operated Isotachophoresis System

Operating Costs

Compared to conventional methods the expenses per analysis are lower due to the above listed economic aspects.

Application Possibilities

In most cases Isotachophoresis is an excellent alternative to conventional ion chromatography.

The use in analytics of complex matrices is eminently advantageous.
Typical examples in these areas are:

- Organic acids in silage
- Organic acids in beverages (wine, juice, etc.)
- Trace impurities in H_2O_2, Glycerol, inks
- Anions and cations in urine and serum
- flavor enhancers, acidifiers, vitamins and other food additives
- Inorganic anions and cations in ground-, surface- or drinking water
- Active agents and metabolites in pharmaceuticals
- Proteins and amino acids

www.jh-analytik.de
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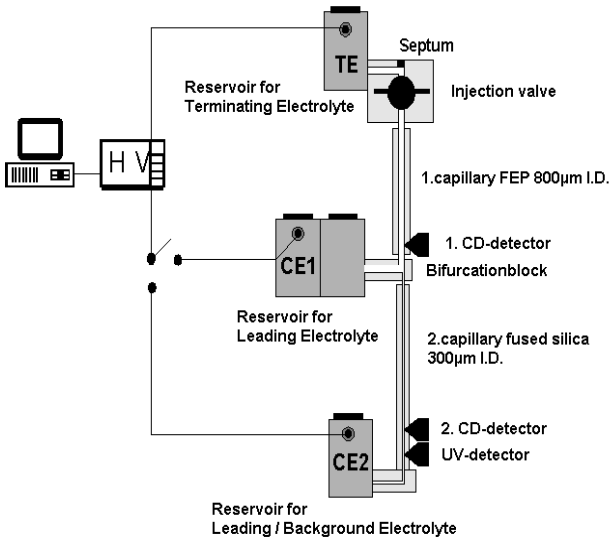
Isotachophoresis System Design

The design of the separation section of an ITP-instrument is shown below:



Capillary Coupling Technique

The innovative coupling of two capillaries offers the following advantages:

- Injection of large volumes resulting in excellent detection- and quantification limits
- "Heart-cutting" for removal of excessive and/or interfering components after the first capillary
- Various operation modes:
  Two-dimensional Isotachophoresis (ITP/ITP) or coupling of Isotachophoresis with Capillary Zone Electrophoresis (ITP/CZE)

Detection in Isotachophoresis

For the detection of the separated ionic components it is possible to use conductivity and/or UV/Vis detection.

Conductivity Detection

Conductivity detection is applicable for all ions in the sample and is recorded by an on-column detection unit. Both, Upper and Lower columns are equipped with a conductivity detector.
The measurement can be done either using contact- or contactless conductivity detection.

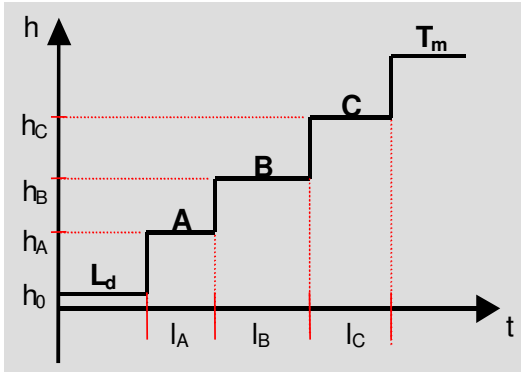
UV/Vis Detection using fiber optics

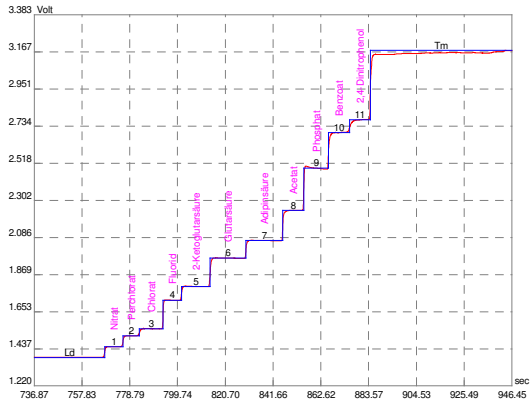
UV/Vis-detection is the most commonly used detection method in liquid chromatography.
This detection method is also used in ITP or ITP-CZE.
Again the capillary is used as the measuring cell using fibre optics for radiation supply.

Isotachopherograms

A detector records the different signal intensities for the individual zones. The diagram below shows an ideal isotachopherogram obtained from the conductivity detector.

The height of the signal (h) is characteristic for each analyte and is used for identification.





Quantification is done by the zone length of the individual zones. The isotachopherogram above shows the detector signal (red) and the ideal, numbered curve (blue) together with the identification (labelling) of an 11-component model mixture.

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