Gradient LC analysis of herbicides and polyaromatic hydrocarbons by isocratic Capillary Electrochromatography

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Environmental/chemical

Abstract

Capillary Electrochromatography (CEC) combines the separation principle of HPLC (partitioning between mobile and stationary phases) with the high efficiency of capillary electroseparation methods. In CEC the electroosmotic flow (EOF) inherent in capillary electrophoretic separations is used to transport solute and mobile phase through a packed capillary column. The properties of the EOF provides higher efficiencies than can be realized with LC. This can be sufficient to allow the transfer of methods conventionally performed by gradient LC to be performed by isocratic CEC.

Experimental

All CEC experiments were performed using the Agilent CE system, equipped for CEC operation and with a built in diode array detector. The system includes an Agilent ChemStation for system control, data collection and data analysis. CEC columns were supplied by Agilent Technologies. Buffer salts were of the highest purity available and organic solvents were HPLC grade. All buffers were filtered and degassed prior to use. Buffers/mobile phase were adjusted to pH prior to the addition of organic modifiers.

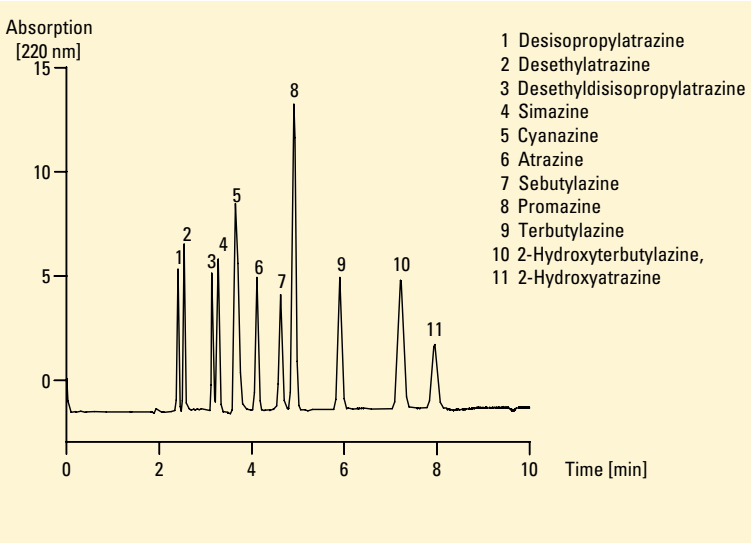


Figure 1
Isocratic CEC alternative to gradient HPLC separation of herbicides

Figure 1 shows the separation of a series of herbicides by CEC. The separation is normally achieved using gradient elution LC. The same is true for figure 2. Here the analysis is of polyaromatic hydrocarbons

Conditions

Column
250 mm × 100 µm; Sperisorb ODS1
Mobile Phase
60 % acetonitrile/40 % 25 mM TRIS pH 8
Voltage
30 kV
Temperature
15 °C

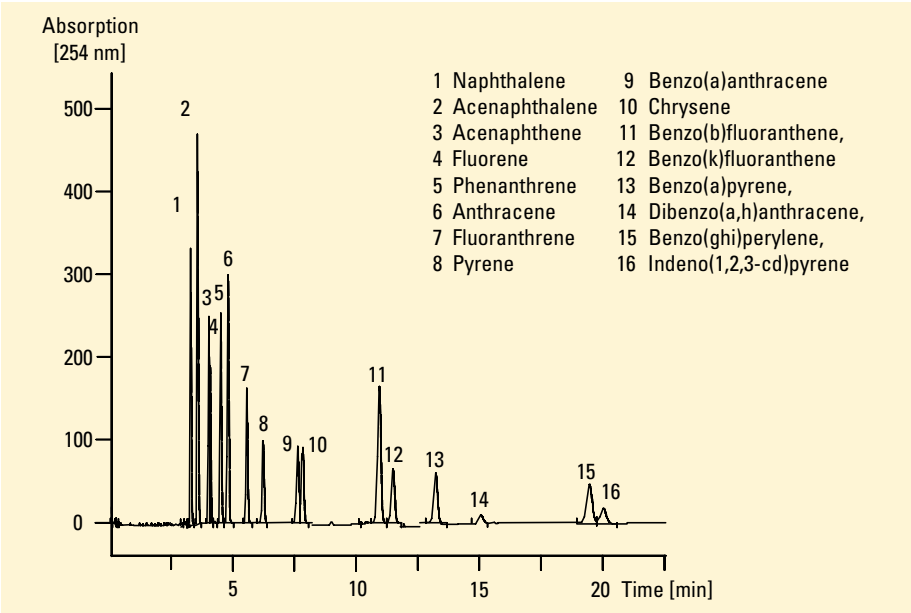


Figure 2
Fast CEC separation of EPA 16 PAH standard on CEC hypersil C18

which are of environmental significance and interest. Conventional analysis of these compounds can be achieved in a similar time however with isocratic CEC operation there is no inter-analysis time required for re-generation of the LC column.

Conclusions

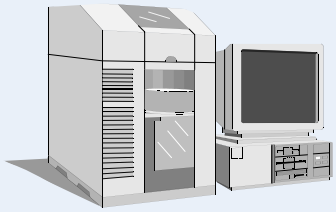
Some gradient LC separations can be succesfully performed using isocratic CEC. Very similar separations can be achieved in the same time frame. Time for re-equilibration of the LC column is not needed and therefore the overall analysis time is reduced.

Conditions

Column
CEC Hypersil C18, 250 mm (350 mm) × 0.1 mm i.d., 2.5 µm
Cell Standard
Eluent
90 % TRIS-HCl 50 mM, pH 8
Voltage 30 kV
Temperature 20 °C
Pressure 10 bar both sides

Equipment

- Agilent Capillary Electrophoresis System
- Agilent ChemStation + software



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