Capillary electrochromatography with contactless conductivity detection for the determination of some inorganic and organic cations using monolithic octadecylsilica columns

Mai T.D., Pham H.V., Hauser P.C.

Centre for Environmental Technology and Sustainable Development (CETASD), Hanoi University of Science, Nguyen Trai Street, 334 Hanoi, Viet Nam; University of Basel, Department of Chemistry, Spitalstrasse 51, 4056 Basel, Switzerland

Abstract: A fast separation of alkali and alkaline earth metal cations and ammonium was carried out by capillary electrochromatography on monolithic octadecylsilica columns of 15 cm length and 100 ?m inner diameter using water/methanol mixtures containing acetic acid as mobile phase. On-column contactless conductivity detection was used for quantification of these non-UV-absorbing species. The method was also extended successfully to the determination of small amines as well as of amino acids, and the separation selectivity was optimized by varying the composition of the mobile phase. Detection limits of about 1 ?M were possible for the inorganic cations as well as for the small amines, while the amino acids could be quantified down to about 10 ?M. The separation of 12 amino acids was achieved in the relatively short time of 10 min.

Author Keywords: Amines; Amino acids; Capacitively coupled contactless conductivity detection; Capillary electrochromatography; Inorganic cations

Index Keywords: Alkaline Earth metal cations; Capacitively coupled contactless conductivity detection; Capillary electrochromatography; Contactless conductivity detection; Detection limits; Fast separation; Inner diameters; Inorganic cations; Mobile phase; Octadecylsilica; Organic cations; Separation selectivity; Water/methanol mixture; Alkaline earth metals; Amination; Amino acids; Ammonium compounds; Chromatography; Light metals; Organic acids; Positive ions; Separation; Amines; acetic acid; alkali metal; alkaline earth metal; amino acid derivative; ammonia; cation; metal ion; methanol; silicon dioxide; water; amino acid analysis; article; capillary electrochromatography; chemical composition; column chromatography; conductance; controlled study; phase separation; priority journal; process optimization; quantitative analysis; separation technique; Acetic Acid; Amines; Amino Acids; Capillary Electrochromatography; Cations; Electric Conductivity; Electrochemistry; Lithium; Metals, Alkali; Metals, Alkaline Earth; Methanol; Quaternary Ammonium Compounds; Silicon Dioxide; Surface Properties; Water

Year: 2009
Source title: Analytica Chimica Acta
Volume: 653
Issue: 2
Page : 228-233
Cited by: 5
Link: Scorpus Link

Chemicals/CAS: acetic acid, 127-08-2, 127-09-3, 64-19-7, 71-50-1; ammonia, 14798-03-9, 51847-23-5, 7664-41-7; methanol, 67-56-1; silicon dioxide, 10279-57-9, 14464-46-1, 14808-60-7, 15468-32-3, 60676-86-0, 7631-86-9; water, 7732-18-5; Acetic Acid, 64-19-7; Amines; Amino Acids; Cations; Lithium, 7439-93-2; Metals, Alkali; Metals, Alkaline Earth; Methanol, 67-56-1; Quaternary Ammonium Compounds; Silicon Dioxide, 7631-86-9; Water, 7732-18-5; octadecylsilica
Correspondence Address: Hauser, P.C.; University of Basel, Department of Chemistry, Spitalstrasse 51, 4056 Basel, Switzerland; email: Peter.Hauser@unibas.ch
ISSN: 32670
CODEN: ACACA
DOI: 10.1016/j.aca.2009.09.014
PubMed ID: 19808119
Language of Original Document: English
Abbreviated Source Title: Analytica Chimica Acta
Document Type: Article
Source: Scopus
Authors with affiliations:

1. Mai, T.D., Centre for Environmental Technology and Sustainable Development (CETASD), Hanoi University of Science, Nguyen Trai Street, 334 Hanoi, Viet Nam, University of Basel, Department of Chemistry, Spitalstrasse 51, 4056 Basel, Switzerland
2. Pham, H.V., Centre for Environmental Technology and Sustainable Development (CETASD), Hanoi University of Science, Nguyen Trai Street, 334 Hanoi, Viet Nam
3. Hauser, P.C., University of Basel, Department of Chemistry, Spitalstrasse 51, 4056 Basel, Switzerland

References:

1. Vanhoenacker, G., Van den Bosch, T., Rozing, G., Sandra, P., (2001) Electrophoresis, 22, pp. 4064-4103
2. Eeltink, S., Kok, W.T., (2006) Electrophoresis, 27, pp. 84-96
3. Eeltink, S., Rozing, G.R., Kok, W.T., (2003) Electrophoresis, 24, pp. 3935-3961
4. Kub??, P., Hauser, P.C., (2009) Electrophoresis, 30, pp. 176-188
5. Brito-Neto, J.G.A., da Silva, J.A.F., Blanes, L., do Lago, C.L., (2005) Electroanalysis, 17, pp. 1198-1206
6. Brito-Neto, J.G.A., da Silva, J.A.F., Blanes, L., do Lago, C.L., (2005) Electroanalysis, 17, pp. 1207-1214
7. Kub??, P., Hauser, P.C., (2004) Electrophoresis, 25, pp. 3387-3397
8. Kub??, P., Hauser, P.C., (2004) Electrophoresis, 25, pp. 3398-3405
9. ol??nov?, V., Kaika, V., (2006) J. Sep. Sci., 29, pp. 1743-1762
10. Pumera, M., (2007) Talanta, 74, pp. 358-364
11. Matysik, F.M., (2008) Microchim. Acta, 160, pp. 1-14
12. Kub??, P., Hauser, P.C., (2008) Anal. Chim. Acta, 607, pp. 15-29
13. Kub??, P., M?ri, M.A., Hauser, P.C., (2004) Analyst, 129, pp. 82-86
14. Kub??, P., Hauser, P.C., (2006) J. Chromatogr. A, 1128, pp. 97-104
15. Kub??, P., Abad-Villar, E.M., Hauser, P.C., (2006) J. Chromatogr. A, 1107, pp. 159-164
16. Kub??, P., Hauser, P.C., (2007) J. Chromatogr. A, 1176, pp. 185-191
17. Hoher?kov?, Z., Opekar, F., (2005) Anal. Chim. Acta, 551, pp. 132-136
18. Hoher?kov?, Z., Opekar, F.E., tul??k, K., (2005) Electroanalysis, 17, pp. 1924-1930

19. Hilder, E.F., Zemann, A.J., Macka, M., Haddad, P.R., (2001) Electrophoresis, 22, pp. 1273-1281
20. Kub??, P., Kub??, P., Kub??, V., Hauser, P.C., Boek, P., (2008) J. Chromatogr. A, 1190, pp. 377-382
21. Ishizuka, N., Kobayashi, H., Minakuchi, H., Nakanishi, K., Hirao, K., Hosoya, K., Ikegami, T., Tanaka, N., (2002) J. Chromatogr. A, 960, pp. 85-96
22. Ishizuka, N., Minakuchi, H., Nakanishi, K., Hirao, K., Tanaka, N., (2001) Colloid Surf. A: Physicochem. Eng. Asp., 187, pp. 273-279
23. Guiochon, G., (2007) J. Chromatogr. A, 1168, pp. 101-168
24. Nakanishi, K., Takahashi, R., Nagakane, T., Kitayama, K., Koheiya, N., Shikata, H., Soga, N., (2000) J. Sol-Gel Sci. Technol., 17, pp. 191-210
25. Tanaka, N., Kinoshita, H., Araki, M., Tsuda, T., (1985) J. Chromatogr., 332, pp. 57-69
26. Yang, C., Ikegami, T., Hara, T., Tanaka, N., (2006) J. Chromatogr. A, 1130, pp. 175-181
27. Tanyanyiwa, J., Hauser, P.C., (2002) Electrophoresis, 23, pp. 3781-3786
28. Tanyanyiwa, J., Galliker, B., Schwarz, M.A., Hauser, P.C., (2002) Analyst, 127, pp. 214-218
29. Zhang, L., Khaloo, S.S., Kub??, P., Hauser, P.C., (2006) Meas. Sci. Technol., 17, pp. 3317-3322
30. Gillespie, E., Connolly, D., Macka, M., Nesterenko, P.N., Paull, B., (2007) Analyst, 132, pp. 1238-1245
31. Gillespie, E., Connolly, D., Macka, M., Hauser, P., Paull, B., (2008) Analyst, 133, pp. 1104-1110
32. Coufal, P., Zuska, J., van de Goor, T., Smith, V., Ga, B., (2003) Electrophoresis, 24, pp. 671-677
33. Tanyanyiwa, J., Schweizer, K., Hauser, P.C., (2003) Electrophoresis, 24, pp. 2119-2124
34. Zuskov?, I., Novotn?, A., Vel?kov?, K., Ga, B., (2006) J. Chromatogr. B, 841, pp. 129-134