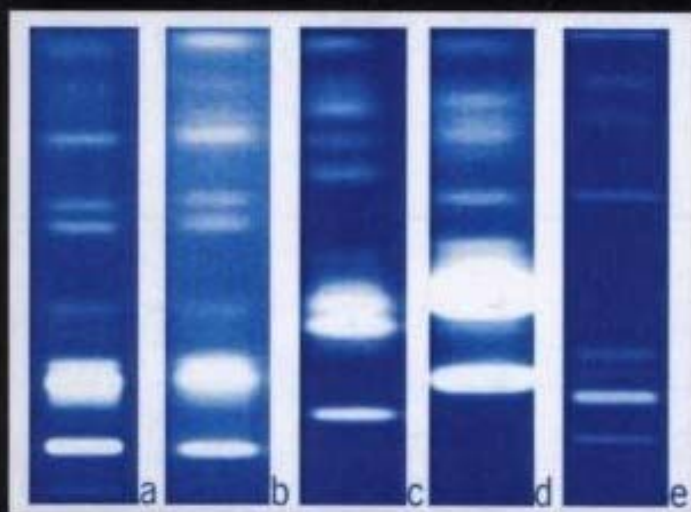


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52. A Pelander, K Sivonen, I Ojanpera, H Vuorela. *J Planar Chromatogr-Mod TLC* 10:434–440, 1997.
53. A Pelander, J Summanen, T Yrjonen, H Haario, I Ojanpera, H Vuorela. *J Planar Chromatogr-Mod TLC* 12:365–372, 1999.
54. C Cimpoiu, T Hodisan, H Nascu. *J Planar Chromatogr-Mod TLC* 10:195–199, 1997.
55. CF Poole, NC Dias. *J Chromatogr A* 892:123–142, 2000.
56. A Bouchereau, P Guenot, F Larber. *J Chromatogr B: Biomed Sci Appl* 747:49–67, 2000.
57. JL Glajch, JJ Kirkland, KM Squire, JM Minor. *J Chromatogr* 199:57–65, 1980.
58. JL Glajch, JJ Kirkland. *Anal Chem* 55:319A–327A, 1983.
59. SFY Li, HK Lee, CP Ong. *J Chromatogr* 506:245–252, 1990.
60. Y Guillaume, C Guinchard. *J Liq Chromatogr* 16:3457–3470, 1993.
61. C Cimpoiu, L Jantschi, T Hodisan. *J Planar Chromatogr-Mod TLC* 11:191–194, 1998.
62. C Cimpoiu, L Jantschi, T Hodisan. *J Liq Chromatogr Relat Technol* 22:1429–1441, 1999.
63. RS Henly. *J Chromatogr Sci* 11:221–232, 1973.
64. DL Massart, H De Clercq. *Anal Chem* 46:1988–1999, 1974.
65. Z Males, M Medic-Saric, F Bucar. *Croat Chem Acta* 71:69–79, 1998.
66. M Medic-Saric, Z Debeljak, Z Males, S Saric. *J Liq Chromatogr Relat Technol* 22:83–103, 1999.
67. Z Males, M Medic-Saric. *J Pharm Biomed Anal* 24:353–359, 2001.
68. C Cimpoiu, T Hodisan. *J Pharm Biomed Anal* 21:895–900, 1999.
69. DL Massart, BGM Vandeginste, SN Deming, Y Michotte, L Kaufman. *Chemometrics: A Textbook*. Amsterdam: Elsevier, 1988, pp 339–369.
70. PS Shenkin, DQ McDonald. *J Comput Chem* 15:899–910, 1994.
71. MC Bruzzoniti, E Mentasti, C Sarzanini. *J Chromatogr B: Biomed Sci Appl* 717:3–25, 1998.
72. T Cserhati, E Forgacs, H Morais, T Mota. *J Biomed Biophys Methods* 45:221–229, 2000.
73. C Sarbu, S Todor. *J Planar Chromatogr-Mod TLC* 11:123–126, 1998.
74. A Bota, C Sarbu, C Marutoiu, V Coman. *J Planar Chromatogr-Mod TLC* 10:358–361, 1997.
75. K Burger, J Kohler, H Jork. *J Planar Chromatogr-Mod TLC* 3:504–510, 1990.
76. E Menziani, B Tosi, A Bonora, P Reschiglian, G Lodi. *J Chromatogr A* 511:396–401, 1990.
77. C Poole, M Belay. *J Planar Chromatogr-Mod TLC* 4:345–359, 1991.
78. G Lodi, C Bigli, V Brandolini, E Menziani, B Tosi. *J Planar Chromatogr-Mod TLC* 10:114–117, 1997.
79. NK Olah, L Muresan, G Cimpan, S Gocan. *J Planar Chromatogr-Mod TLC* 11:361–364, 1998.
80. HJ Stan, F Schwarzer. *J Chromatogr A* 819:35–44, 1998.