

Hyphenated two-dimensional chiral capillary electrophoresis - Tandem mass spectrometry method for ultra-trace determination of antihistamine enantiomers in biological samples.

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Abstract

A chemical vapor generation (CVG) method is developed for determination of cadmium (Cd) by ICP-MS. Titanium (III) and titanium (IV) were utilized for the first time as novel additives to enhance generation of volatile Cd species, and their synergistic effects were investigated for thiourea, L-cysteine and potassium cyanide (KCN) with different mineral acids. Both Ti (III) and Ti (IV) provided the highest enhancement with KCN. The improvement with thiourea was marginal (ca. 2-fold), while L-cysteine boosted signals slightly only with Ti (III) in H₂ SO₄. Optimum CVG conditions were 4% HCl + 0.03 M Ti(III) + 0.16 M KCN and 2% HNO₃ + 0.03 M Ti(IV) + 0.16 M KCN. A 3% (m/v) NaBH₄ solution was adequate for successful vapor generation. Under these conditions, sensitivity was enhanced 40-fold with Ti(III) and 35-fold with Ti(IV), that are the highest enhancement factors achieved so far in Cd vapor generation. Detection limits (3s) were 3.2 and 6.4 ng L⁻¹ for ¹¹¹Cd isotope using Ti(III) and Ti(IV), respectively. Evidence indicated that Ti (III) and Ti(IV) enhanced Cd vapor generation catalytically. Effects of transition metal ions, including Co(II), Cr(III), Cu(II), Fe(III), Mn(II), Ni(II) and Zn(II) were not significant up to 1.0 µg mL⁻¹. Among hydride forming elements, Bi, Pb, Sb and Sn depressed signals above 0.1 µg mL⁻¹. No interferences were observed from As(III) and Se(IV). The method was validated with determination of Cd by CVG-ICP-MS in certified reference materials, including Nearshore seawater (CASS-4), Bone ash (SRM 1400), Dogfish liver (DOLT-4), Mussel tissue (SRM 2976) and Domestic Sludge (SRM 2781).



Biography:

Peter Mikuš has completed his PhD from Comenius University (Slovakia). He is researcher, University teacher, Associated Professor, and Director of the Toxicological and Antidoping Center at the Faculty of Pharmacy Comenius University in Bratislava (FPCU) as well as head of the Department of Pharmaceutical Analysis and Nuclear Pharmacy FPCU. A research team of P.M. is focused on the development, validation and application of advanced hyphenated analytical methods, based on a combination of 2D-separation and spectral (UV-VIS, MS/MS) techniques, for pharmaceutical and biomedical research. He has published more than 60 papers in reputed CC journals.

Speaker Publications:

1. "Hyphenated two-dimensional chiral capillary electrophoresis - Tandem mass spectrometry method for ultra-trace determination of antihistamine enantiomers in biological samples"; Journal of R&D. / 2020 / 8(8) /pp 2311-3278

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