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Enantiomeric Separation of Epinephrine and Salbutamol by Micellar Electrokinetic Chromatography Using β-Cyclodextrin as Chiral Additive

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Abstract: Enantiomeric separation of epinephrine and salbutamol was investigated by micellar electrokinetic chromatography employing β-cyclodextrin as chiral additive in ammonium chloride-ammonia solution. The analytes were detected by electrochemistry using gold microelectrode at +0.65 V *versus* SCE reference electrode. The effects of detection potential, concentration of β-cyclodextrin, concentration of sodium dodecyl sulfate, pH value of electrolyte and applied voltage were discussed.

Keywords: Micellar electrokinetic chromatography, electrochemical detection, enantiomer separation, epinephrine, salbutamol.

As the enantiomers of epinephrine and salbutamol have different pharmacological and toxicological activities, separation and quantitation of the single enantiomers are required. Capillary electrophoresis (CE) has become a powerful tool for enantiomer separation, particularly because of the shorter analysis times which often can be achieved[1-3]. Native CDs (α, β and γ) and their derivatives have been mainly used in capillary zone electrophoresis (CZE) and several instances the combination of CDs and micellar electrokinetic chromatography (CD-MEKC) allowed the enantiomeric resolution of neutral compounds.

In this paper, a method for enantiomeric separation of epinephrine and salbutamol was investigated based on the β-cyclodextrin (β-CD)-sodium dodecyl sulfate (SDS)-micellar electrokinetic chromatography (MEKC) separation mode.

Experiments were carried out using the laboratory-made capillary electrophoresis system (School of Chemistry and Chemical Engineering of Zhongshan University). The separation was performed at 25°C in untreated fused-silica capillaries, 50 cm × 25 μm I. D.. The injection of sample was performed hydrodynamically for 15s and the applied voltage was 10 kV. The analytes were detected by electrochemistry using gold microelectrode at +0.65 V *versus* SCE reference electrode in 15 mmol/L ammonium chloride solution adjusted to pH 8.6 by ammonia solution, containing 8 mmol/L β-CD and 15 mmol/L SDS.

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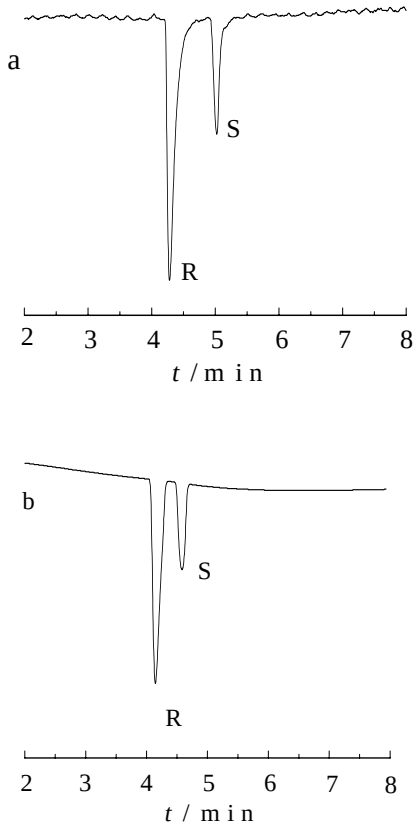
Figure 1 Electropherograms for the enantiomeric separation of (a) epinephrine and (b) salbutamol



In this work, we discussed the effects of concentration of β-cyclodextrin, concentration of sodium dodecyl sulfate in detail (the experiment results are shown in **Table 1** and **Table 2**). Detection potential, pH value of electrolyte and applied voltage on selectivity and recognition were investigated also. Under the optimized conditions, baseline separation of the enantiomers could be accomplished in 6 minutes and the capillary electropherograms of the enantiomers of epinephrine and salbutamol are shown in **Figure 1**.

Table 1 The effect of β-CD concentration on migration times and resolution

	C(β-CD)/mmol•L^{-1}	0	2	4	6	8	10
	t_1 / min	6.78	5.89	5.13	4.62	4.20	3.98
Epinephrine	t_2 / min	6.78	6.18	5.70	5.28	4.94	4.80
	R_S	0	0.21	0.56	1.24	2.02	1.98
	t_1 / min	6.49	5.64	4.92	4.46	4.05	3.90
Salbutamol	t_2 / min	6.49	5.91	5.43	5.05	4.72	4.64
	R_S	0	0.18	0.49	1.11	1.82	1.76

t_1, t_2: migration time; R_s: resolution

Table 2 The effect of SDS concentration on migration times and resolution

	C(SDS)/mmol•L^{-1}	0	5	10	15	20	25
Epinephrine	t_1 / min	3.74	3.86	4.01	4.20	4.42	4.67
	t_2 / min	3.96	4.13	4.62	4.94	5.12	5.68
	R_S	0.39	0.58	1.66	2.02	1.91	1.67
Salbutamol	t_1 / min	3.71	3.82	3.93	4.05	4.20	4.41
	t_2 / min	3.87	4.02	4.47	4.72	4.82	4.99
	R_S	0.43	0.53	1.47	1.82	1.68	1.58

t_1, t_2: migration time; R_s: resolution

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