Electronic Supplementary Material (ESI) for RSC Advances.


# A Novel C18 Reversed Phase Organic-Silica Hybrid Cationic Monolithic Capillary Column with Ionic Liquid as Organic Monomer via "One-Pot" Approach for Capillary Electrochromatography

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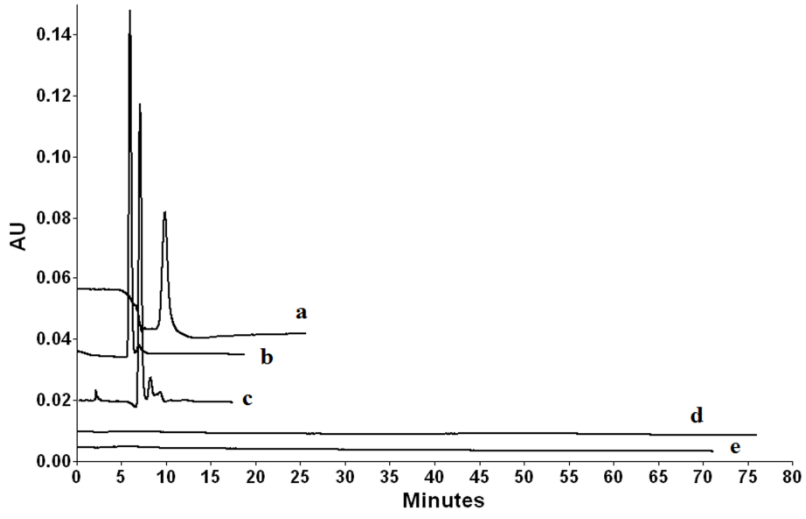
**Preparation of control columns**

Preparation of control column 1 was similar to that of the $VC_{18}HIm^{+}Br^{-}$ hybrid monolithic capillary column except for removing the IL from the prepolymerization mixture.

The control column 2 was prepared with prepolymerization mixture containing i-PrOH (500 μL), n-BuOH (100 μL), AIBN (5 mg), $VC_{18}Him^{+}Br^{-}$ (150 mg), and EGDMA (100 μL) in a 60 °C water bath for 24 h.

Preparation of control column 3 contained two steps. Firstly, a vinyl-functionalized monolith was obtained with prepolymerization mixture containing MeOH (600 μL), TEOS (300 μL), VTES (200 μL), CTAB (5 mg), water (110 μL), and 1.0 M ammonia water (50 μL) in a 40 °C water bath for 12 h. Then, a solution containing 250 mg/mL and 8 mg/mL AIBN was pumped through the column for 10 min. After that, the column was incubated in 60 °C water bath for another 12 h.

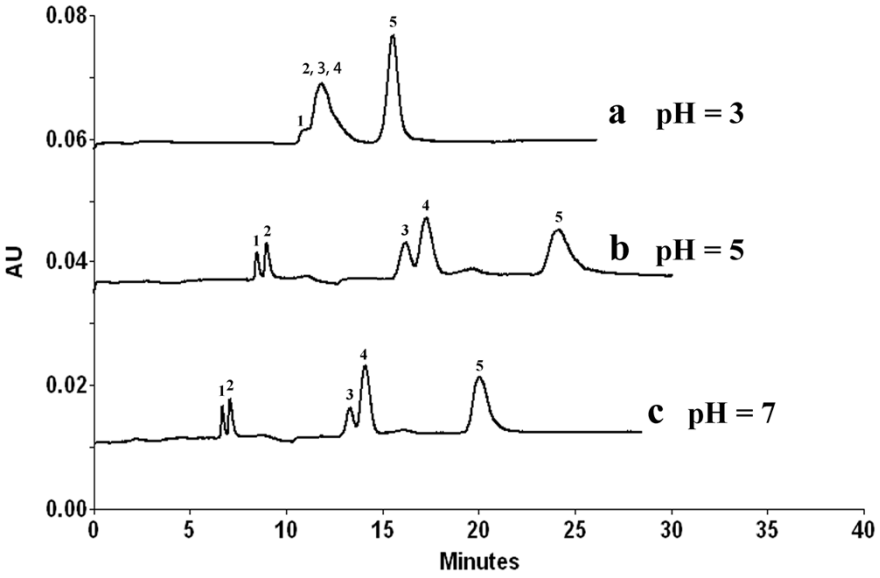
**The EOF of different columns**



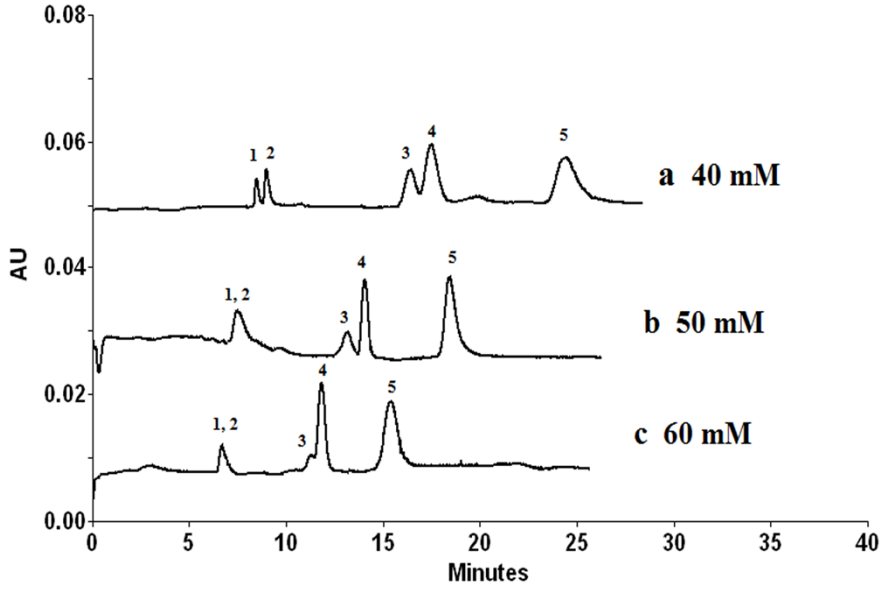

**Supplementary Fig. 1.** The EOF of different columns; (a) control column 3 with −10 kV voltage; (b) control column 2 with −10 kV voltage; (c) $VC_{18}HIm^{+}Br^{-}$ hybrid monolithic capillary column with −10 kV voltage; (d) control column 1 with −10 kV

voltage; (e) control column 1 with 10 kV voltage. Experimental conditions: column dimension, 20 cm × 100 μm i.d.; injection, −0.5 psi for 5 s; detection wavelength, 214 nm; mobile phase, ACN/30 mM acetic acid buffer at pH 3.0 = 40/60 (v/v).

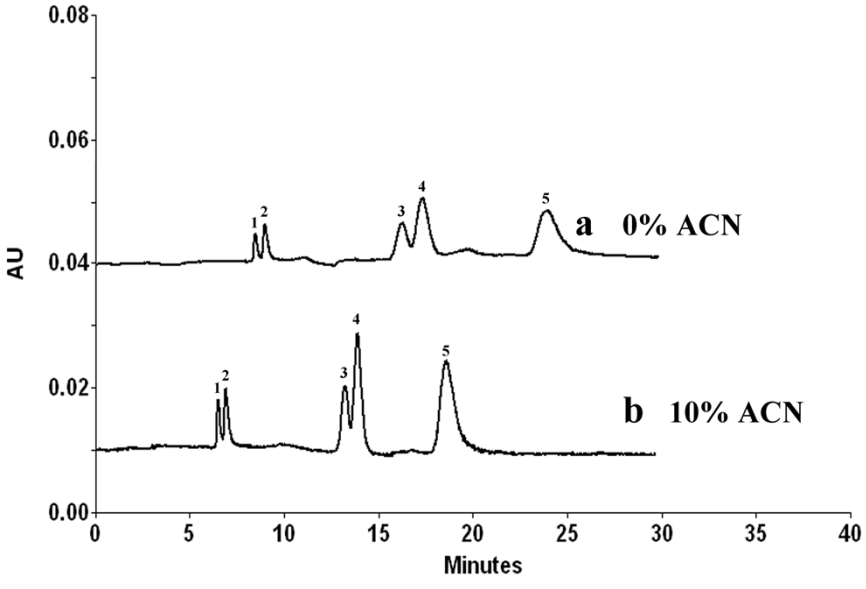
**Separation of amino acids in different condition**




**Supplementary Fig. 2.** Effect of pH on the separation of amino acids on the $VC_{18}HIm^{+}Br^{-}$ hybrid monolithic capillary column by CEC. Solutes, (1) aspartic acid, (2) glutamic acid, (3) glutamine, (4) L-proline, (5) L-phenylalanine. Experimental conditions: column dimension, 20 cm × 100 μm i.d.; injection, −1.0 psi for 15 s; separation voltage, −5 kV; detection wavelength, 190 nm; mobile phase, 40 mM $H_3PO_4$-$Na_2HPO_4$ buffer at different pH.

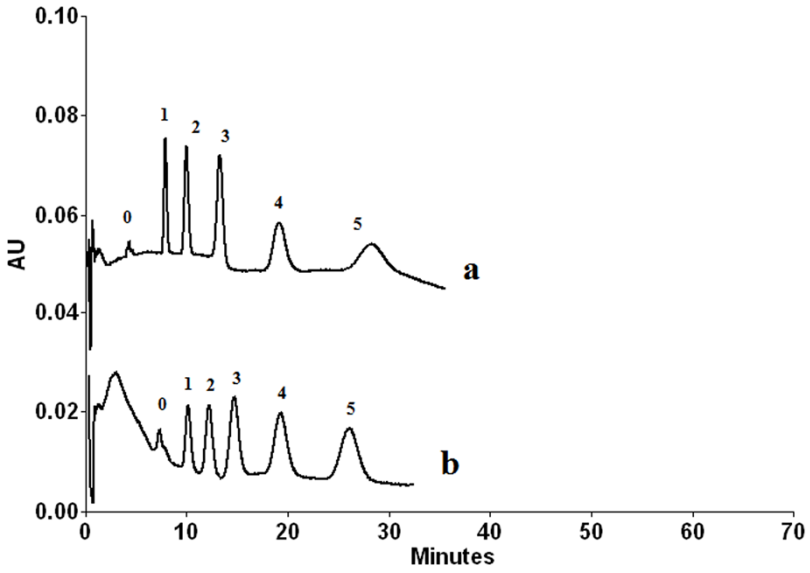



**Supplementary Fig. 3.** Effect of salt concentration on the separation of amino acids on the $VC_{18}HIm^{+}Br^{-}$ hybrid monolithic capillary column by CEC. Solutes, (1) aspartic acid, (2) glutamic acid, (3) glutamine, (4) L-proline, (5) L-phenylalanine. Experimental conditions: column dimension, 20 cm × 100 μm i.d.; injection, −1.0 psi for 15 s; separation voltage, −5 kV; detection wavelength, 190 nm; mobile phase, different salt concentration buffer at pH 5.

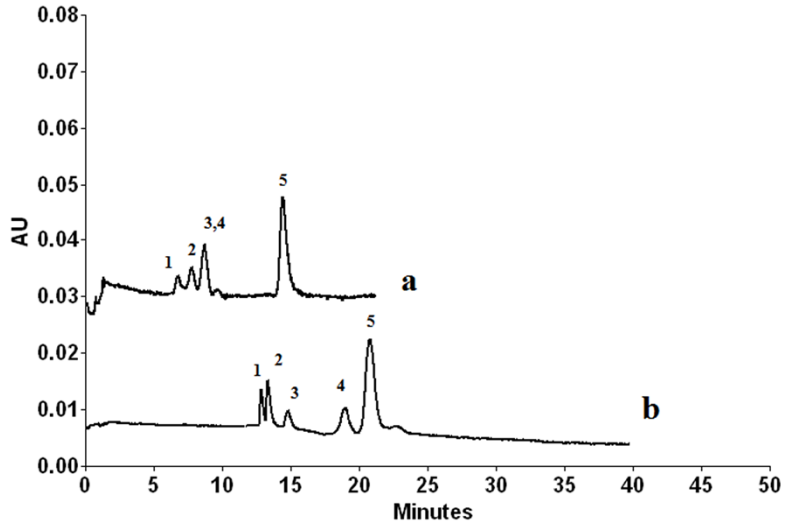


**Supplementary Fig. 4.** Effect of ACN content on the separation of amino acids on the VC18HIm+Br− hybrid monolithic capillary column by CEC. Solutes, (1) aspartic acid, (2) glutamic acid, (3) glutamine, (4) L-proline, (5) L-phenylalanine. Experimental conditions: column dimension, 20 cm × 100 μm i.d.; injection, −1.0 psi for 15 s; separation voltage, −5 kV; detection wavelength, 190 nm; mobile phase, 40 mM $H_3PO_4$-$Na_2HPO_4$ buffer at pH 5.

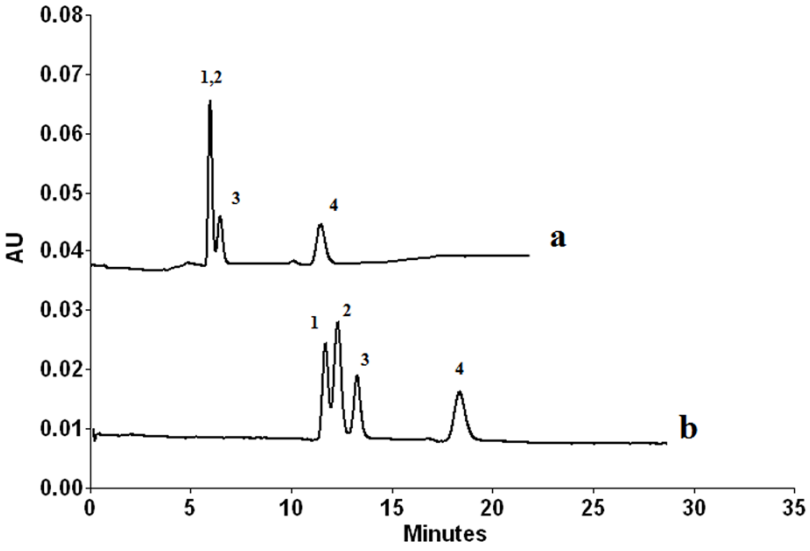
**Separation of control column**




**Supplementary Fig. 5.** Separation of alkylbenzenes on the control columns by CEC; a, control column 2; b, control column 3. Solutes: (0) thiourea, (1) benzene, (2) toluene, (3) ethylbenzene, (4) propylbenzene, (5) butylbenzene. Experimental conditions: mobile phase, ACN/30 mM acetic acid buffer at pH 3.0 = 45/55 (v/v); column dimension, 20 cm × 100 μm i.d.; injection, −0.5 psi for 5 s; separation voltage, −10 kV; detection wavelength, 214 nm.




**Supplementary Fig. 6.** Separation of amino acids on the control columns by CEC; a, control column 2; b, control column 3. Solutes: (1) aspartic acid, (2) glutamic acid, (3) glutamine, (4) L-proline, (5) L-phenylalanine. Experimental conditions: column dimension, 20 cm × 100 μm i.d.; injection, −1.0 psi for 15 s; separation voltage, −5 kV; detection wavelength, 190 nm; mobile phase, 40 mM $H_3PO_4$-$Na_2HPO_4$ buffer at pH 4.4.




**Supplementary Fig. 7**. Separation of basic compounds on the control columns by CEC; a, control column 2; b, control column 3. Solutes: (1) methimazole, (2) aniline, (3) gramine, (4) 1,2-diphenyl hydrazine. Experimental conditions: column dimension,

20 cm × 100 μm i.d.; injection, −0.5 psi for 5 s; separation voltage, −10 kV; detection wavelength, 214 nm; mobile phase, ACN/30 mM $H_3PO_4$-$Na_2HPO_4$ buffer at pH 5.0 = 40/60 (v/v).