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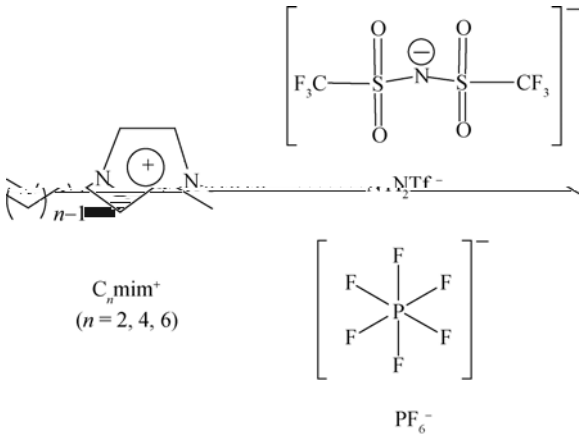
摘要 , 18
6(DCH18C6) Sr^{2+} . , DCH18C6/
Sr^{2+} DCH18C6/ , Sr^{2+}
10^3 . , Sr^{2+}
. , , Sr^{2+}
. Na^+ K^+ Sr^{2+} .
Sr^{2+} .

关键词

1

,



1 **$C_n$mim$^+$** **NTf_2^-, PF_6^-**

Sr^{2+} , , γ
,
[11,12].
Sr^{2+} ,
,

.

, DCH18C6 ,
Sr^{2+} ,
.
- Sr^{2+} ,
.
Sr^{2+}
, .

2

2.1

C_4mimPF_6 $C_n$mimNTf_2(n=2 4 6)
[13~15]
,
^{1}H NMR , 99%.
18- -6(DCH18C6), ,
,
DCH18C6 ,
98%.
$Sr(NO_3)_2$ $SrCl_2$ $NaNO_3$ KNO_3 K_2SO_4
.

2.2

HZQ-C ; LZD4-0.8
( ); 180-80
; U3010 ; IKA Genius 3
.

2.3

0.5 mL DCH18C6
1.0 mL , , 30 min(
, 10 min
), Sr^{2+} ,
Sr^{2+} , *E*
D.
Sr^{2+} ,
(-) . 0~40
μg/mL, 1 mg/mL $Sr(NO_3)_2$,

Sr^{2+} .

, , NTf_2^-

PF_6^- ; NTf_2^-

, ,

Sr^{2+} .

3.2 DCH18C6

DCH18C6

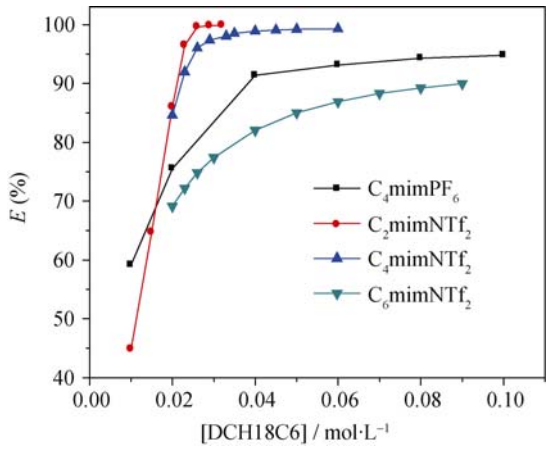
2 . DCH18C6 ,

Sr^{2+} , .

, ,

Sr^{2+} , Sr^{2+} ,

.



2 DCH18C6 Sr^{2+}

, $[Sr^{2+}] = 0.01\ mol \cdot L^{-1}$, $V_{IL}/V_{Aq}=1/2$

,

Sr^{2+}

$C_2mimNTf_2 > C_4mimNTf_2 > C_4mimPF_6 > C_6mimNTf_2$,

$C_2mimNTf_2$ DCH18C6 Sr^{2+}

.

3.3

, , ~ ,

.

. . $C_2mimNTf_2$ $C_4mimNTf_2$, $NaNO_3$

, $C_6mimNTf_2$

3.4

, $NaNO_3$ Sr^{2+} ,

0.1 mol·L^{-1} $NaNO_3$ E_{Sr} ,

, $^{90}Sr^{2+}$.

$^{137}Cs^+$, Na^+ Al^{3+} KNO_3 E_{Sr}

. , , $NaNO_3$

Sr^{2+} . , K^+ Sr^{2+} ,

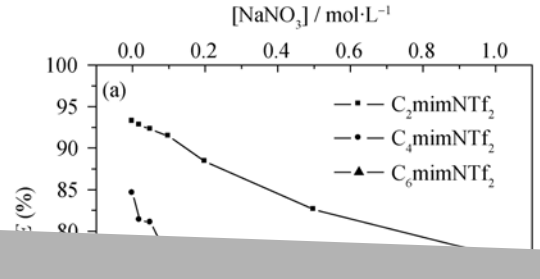
$NaNO_3$ KNO_3 DCH18C6/ .

$C_nmimNTf_2$ Sr^{2+} , 4 . Sr^{2+}

. ,

, $C_6mimNTf_2$ $C_2mimNTf_2$

.



3.5 **Sr^{2+}**

, ,

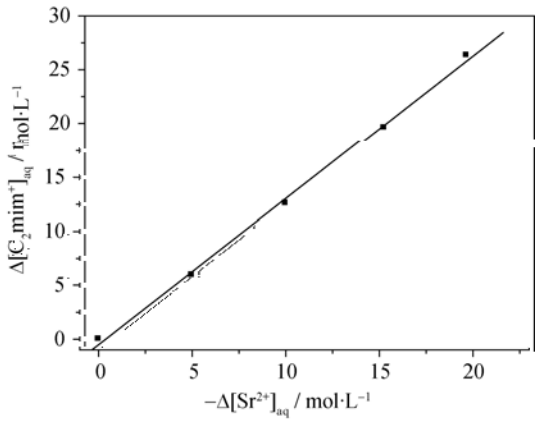
, .
, , , .
DCH18C6 Sr^{2+} , [16]

$$Sr^{2+}_{aq} + CE_{org} + 2\ NO^{-}_{3aq} \rightleftharpoons Sr \cdot CE \cdot (NO_3)_{2org} \quad (1)$$

CE DCH18C6.
[10, 17] ,
, .
211 nm ,
$C_2mimNTf_2$ Sr^{2+} C_2mim^+
, DCH18C6
Sr^{2+} , 2 5 .
,
$SrCl_2$ $Sr(NO_3)_2$.
2 , ,
Sr^{2+} C_2mim^+ , Sr^{2+}
, [10] .
, 5 , Sr^{2+} C_2mim^+

2 DCH18C6/$C_2mimNTf_2$ Sr^{2+} Sr^{2+} C_2mim^+ (DCH18C6 = 0.1 mol·L^{-1})

$[Sr^{2+}]_{initial}$ / 10^{-3} mol·L^{-1}	0	5.00	10.0	15.0	20.0
$\Delta[Sr^{2+}]_{aq}$ / 10^{-3} mol·L^{-1}	0	–5.00	–10.0	–15.0	–19.4
$\Delta[C_2mim^+]_{aq}$ / 10^{-3} mol·L^{-1}	0	5.94	12.6	19.6	26.3



5 DCH18C6/$C_2mimNTf_2$ Sr^{2+} Sr^{2+} C_2mim^+

, ,
Sr^{2+}
Sr^{2+} , Sr^{2+} ,
C_2mim^+ . ,
C_2mim^+ ,
Cl^- ,
. Dietz , $C_nmimNTf_2$
(n= 5, 6, 8, 10) ,
DCH18C6 Sr^{2+} NO_3^-
, ; n = 10
, [17].
$C_2mimNTf_2$, ,
, $SrCl_2$,
NO_3^- , Cl^- $C_2mimNTf_2$
,
. ,
,

$$Sr^{2+}_{aq} + CE_{org} + 2\ C_n min^{+}_{org} \rightleftharpoons Sr \cdot CE^{2+}_{org} + 2\ C_n min^{+}_{aq} \quad (2)$$

. , ,
NO_3^- ,
NO_3^- ,
Sr^{2+} [3]. H^+
DCH18C6 ,
, NO_3^- ,
Sr^{2+} .
, NO_3^-
, NO_3^-
, H^+ ,
Sr^{2+} .
3 .
,
ч ї о ”

3

	$Sr \cdot CE^{2+} + 2\ NO_3^- \rightleftharpoons Sr \cdot CE^{2+} \cdot 2\ NO_{3\,org}^-$ $H \cdot CE^{+} + NO_3^- \rightleftharpoons H \cdot CE^{+} \cdot NO_{3\,org}^-$	$Sr \cdot CE^{2+} + 2\ C_n mim_{org}^{+} \rightleftharpoons Sr \cdot CE_{org}^{2+} \cdot 2\ C_n mim^{+}$ $Sr \cdot CE^{2+} + 2\ NO_3^- \rightleftharpoons Sr \cdot CE^{2+} \cdot 2\ NO_{3\,org}^-$ $H \cdot CE^{+} + NO_3^- \rightleftharpoons H \cdot CE^{+} \cdot NO_{3\,org}^-$
	NO_3^-	H^+
	H^+	NO_3^-
	E_{Sr}	E_{Sr}

DCH18C6 Sr^{2+}

, Sr^{2+}

. , DCH18C6

Sr^{2+} $C_2mimNTf_2$ >

$C_4mimNTf_2$ > C_4mimPF

9 Visser A E, Swatloski R P, Reichert W M, Griffin S T, Rogers R D. Traditional extractants in nontraditional solvents: Groups 1 and 2 extraction by crown ethers in room-temperature ionic liquids. Ind Eng Chem Res, 2000, 39(10): 3596—3604

10 Dietz M L, Dzielawa J A. Ion-exchange as a mode of cation transfer into room-temperature ionic liquids containing crown ethers: Implications for the 'Greenness' of ionic liquids as diluents in liquid-liquid extraction. Chem Commun, 2001, 20: 2124—2125

11 Yuan L Y, Peng J, Xu L, Zhai M L, Li J Q, Wei G S. Influence of gamma-radiation on the ionic liquid [C_4mim][PF_6