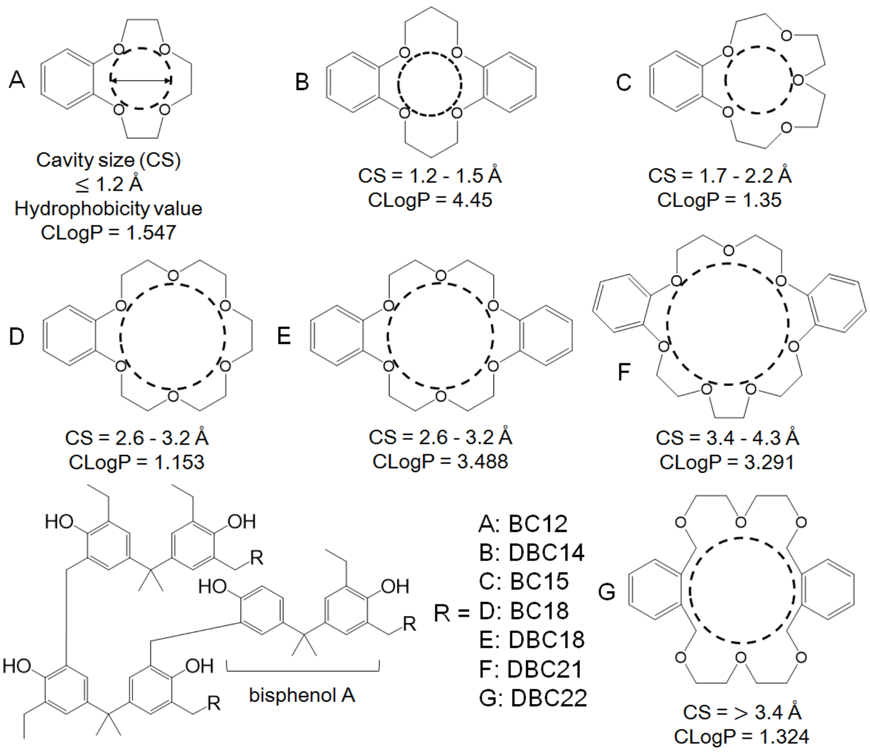

A
Cavity size (CS)
≤ 1.2 Å
Hydrophobicity value
CLogP = 1.547
B
CS = 1.2 - 1.5 Å
CLogP = 4.45
C
CS = 1.7 - 2.2 Å
CLogP = 1.35
D
CS = 2.6 - 3.2 Å
CLogP = 1.153
E
CS = 2.6 - 3.2 Å
CLogP = 3.488
F
CS = 3.4 - 4.3 Å
CLogP = 3.291
HO
OH
R
bisphenol A
R =
A: BC12
B: DBC14
C: BC15
D: BC18
E: DBC18
F: DBC21
G: DBC22
G
CS = > 3.4 Å
CLogP = 1.324

Fig. 1

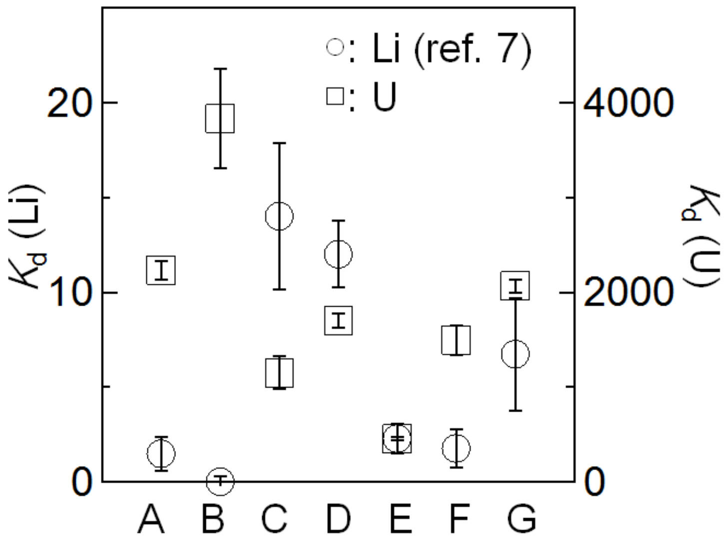
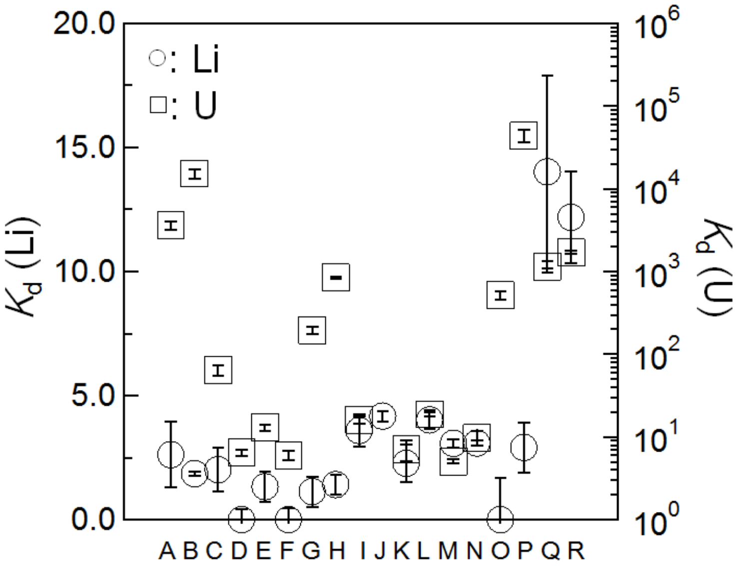

○: Li (ref. 7)
□: U
Kd (Li)
Kd (U)
0
10
20
0
2000
4000
A B C D E F G

Fig. 2



○: Li
□: U
20.0
15.0
10.0
5.0
0.0
K_d (Li)
10^6
10^5
10^4
10^3
10^2
10^1
10^0
K_d (U)
A B C D E F G H I J K L M N O P Q R

Fig. 3

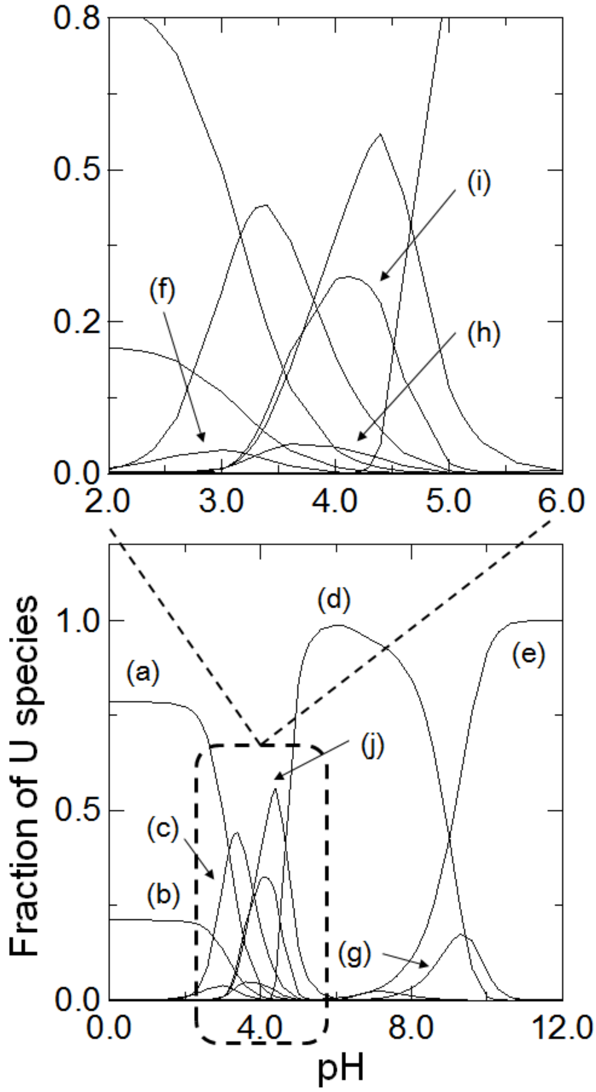

0.8
0.5
0.2
0.0
2.0
3.0
4.0
5.0
6.0
(f)
(h)
(i)
1.0
0.5
0.0
0.0
4.0
8.0
12.0
Fraction of U species
pH
(a)
(b)
(c)
(d)
(e)
(g)
(j)

Fig. 4

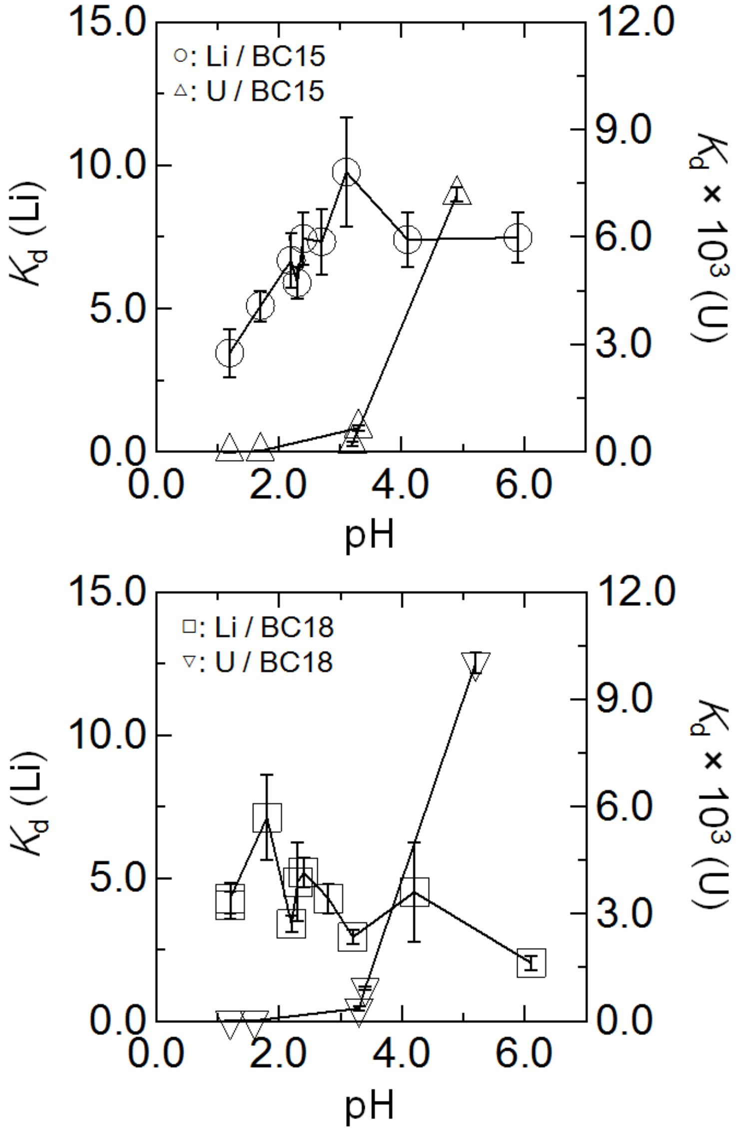

15.0
10.0
5.0
0.0
12.0
9.0
6.0
3.0
0.0
○: Li / BC15
△: U / BC15
K_d (Li)
$K_d \times 10^3$ (U)
0.0
2.0
4.0
6.0
pH
□: Li / BC18
▽: U / BC18
K_d (Li)
$K_d \times 10^3$ (U)
pH

Fig. 5

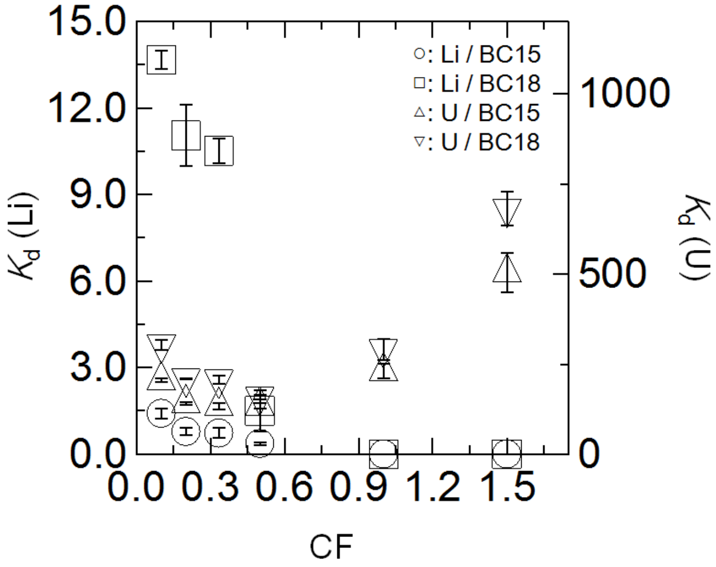

15.0
12.0
9.0
6.0
3.0
0.0
K_d (Li)
○: Li / BC15
□: Li / BC18
△: U / BC15
▽: U / BC18
1000
500
0
K_d (U)
0.0 0.3 0.6 0.9 1.2 1.5
CF

Fig. 6

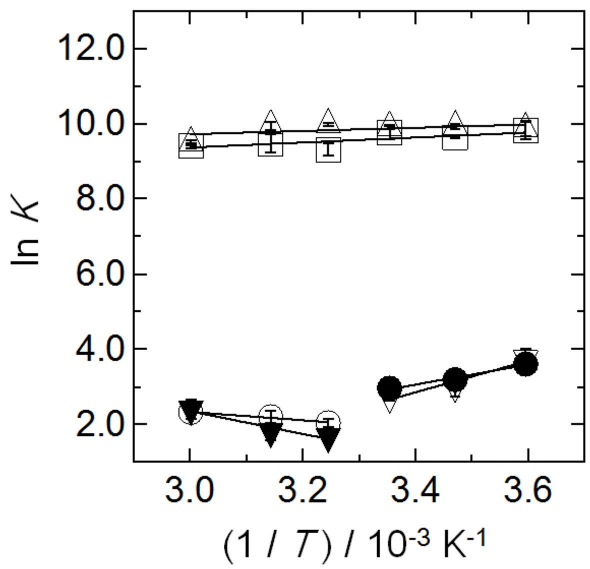

12.0
10.0
8.0
6.0
4.0
2.0
ln K
3.0 3.2 3.4 3.6
(1 / T) / 10^{-3} K^{-1}

Fig. 7

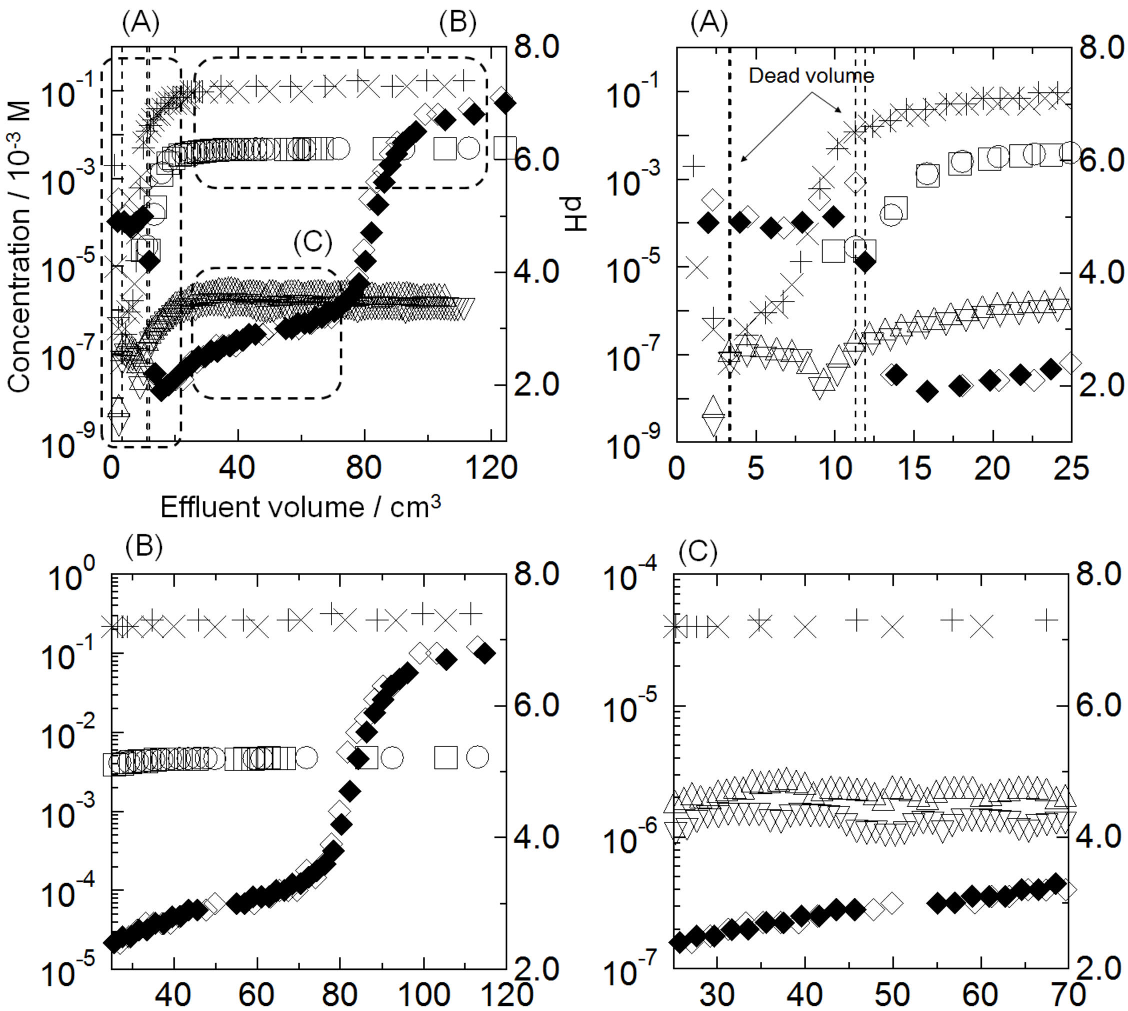


Fig. 8

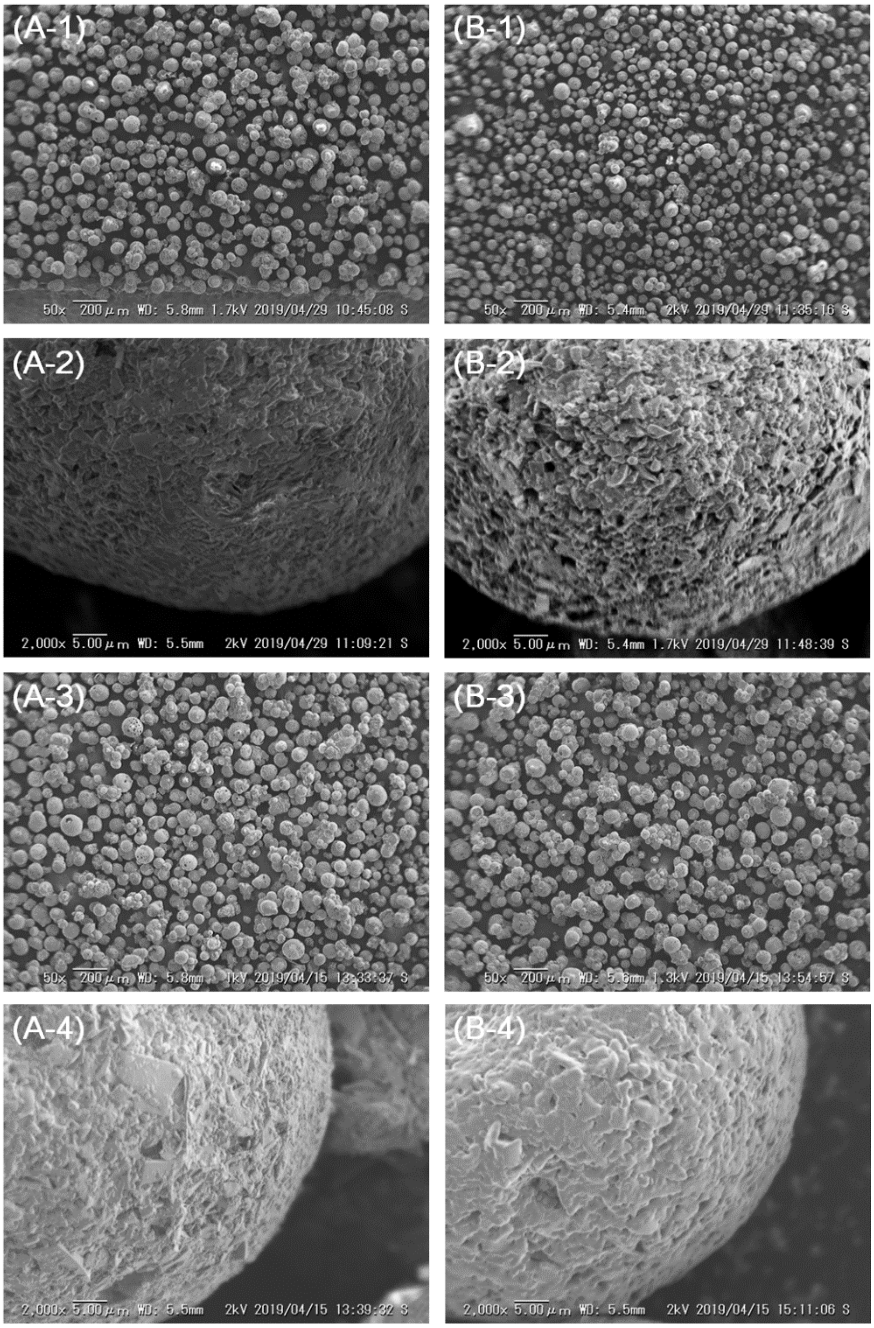

(A-1)
50x 200μm WD: 5.8mm 1.7kV 2019/04/29 10:45:08 S
(B-1)
50x 200μm WD: 5.4mm 2kV 2019/04/29 11:35:16 S
(A-2)
2,000x 5.00μm WD: 5.5mm 2kV 2019/04/29 11:09:21 S
(B-2)
2,000x 5.00μm WD: 5.4mm 1.7kV 2019/04/29 11:48:39 S
(A-3)
50x 200μm WD: 5.8mm 1kV 2019/04/15 13:33:37 S
(B-3)
50x 200μm WD: 5.6mm 1.3kV 2019/04/15 13:54:57 S
(A-4)
2,000x 5.00μm WD: 5.5mm 2kV 2019/04/15 13:39:32 S
(B-4)
2,000x 5.00μm WD: 5.5mm 2kV 2019/04/15 15:11:06 S

Fig. 9

Figure captions:

Fig. 1

Structural formulas, cavity sizes, and values of hydrophobicity of synthesized crown ether adsorbents.

Fig. 2

Plots of K_d values *vs.* seven kinds of crown ether adsorbents. Temp. = room temp. Particle size = 100 - 250 mesh, adsorbent = 500 mg, solution volume = 10 mL. A: BC12, B: DBC14, C: BC15, D: BC18, E: DBC18, F: DBC21, G: DBC22.

Fig. 3

Plots of K_d values vs. various types of adsorbents. Temp. = room temp. Adsorbent = 500 mg, solution volume = 10 mL. A: WA10, B: WA20, C: WA30, PA308, E: PA312, F: PA316, G: WK10, H: WK40L, I: PK208, J: PK216, K: PK220, L: PK228, M: PK228L, N: SK112L, O: BT-AG, P: CR10, Q: BC15, and R: BC18. The data of Q and R were referred from our previous work [7].

Fig. 4

Distribution diagram of U(VI) species as a function of pH at 298 K. The stability constants between $U(VI)O_2^{2+}$ and OH^-, Cl^-, CO_3^{2-}, and $CO_2(g)$ [17]. (a): UO_2^{2+}, (b): UO_2Cl^+, (c): $(UO_2)_2(OH)_2^{2+}$, (d): $(UO_2)_{11}(CO_3)_6(OH)_{12}^{2-}$, (e): $(UO_2)_2CO_3(OH)_3^-$, (f): $(UO_2)_2(OH)^{3+}$, (g): $UO_2(CO_3)_3^{4-}$, (h): $(UO_2)_3(OH)_4^{2+}$, (i): $(UO_2)_4(OH)_6^{2+}$, (j): $(UO_2)_3(OH)^{5+}$. With respect to the fraction of other species, UO_2Cl_2, UO_2OH^+, $UO_2(OH)_3^-$, $(UO_2)_3(OH)_7^-$, $(UO_2)_4(OH)_3^{5+}$, UO_2CO_3, $UO_2(CO_3)_2^{2-}$, $(UO_2)_3(CO_3)_6^{6-}$ are excluded because of their small fraction of U(VI) species. Ionic strength = 0.5. $[CO_3^{2-}]_T = 2.4 \times 10^{-3}$ M [6]. $[Cl^-]_T = 6.1 \times 10^{-1}$ M [6]. $[U]_T = 4.2 \times 10^{-7}$ M. $[CO_2(g)]_T = 8.9 \times 10^{-3}$ M [40].

Fig. 5

Plots of K_d values vs. pH values. Temp. = room temp. Particle size = 100 - 250 mesh, adsorbent = 500 mg, solution volume = 10 mL. ○: Li / BC15, △: U / BC15, □: Li / BC18, ▽: U / BC18.

Fig. 6

Plots of K_d values vs. CFs. Temp. = room temp. Particle size = 100 - 250 mesh, adsorbent = 500 mg. Solution volume = 10 mL. $[Li]_i = (8.0 \pm 0.9) \times 10^{-5}$ M. $[U]_i = (8.2 \pm 2.5) \times 10^{-7}$ M.

Fig. 7

Plots of ln K_d values *vs.* 1 / *T* values. Temp. = 278 - 333 K. Particle size = 100 - 250 mesh, adsorbent = 0.50 g for U ion and 1.0 g for Li ion, solution volume = 10 mL.○●: Li / BC15, □: U / BC15, △: U / BC18, ▽▼: Li / BC18.

Fig. 8

Chromatogram of Li and U ions using BC15 and BC18 adsorbents at 298 K. Particle size = 100 - 250 mesh. ○: Li for BC15, □: Li for BC18, ◇: pH for Li with BC15, ◆: pH for Li with BC18, △: U for BC15, ▽: U for BC18, ×: pH for U with BC15, +: pH for U with BC18.

Fig. 9

SEM images of BC15 and BC18 adsorbents. (A-1) BC15 adsorbent before test, M = 50× (A-2) BC15 adsorbent before test, M = 2000× (A-3) BC15 adsorbent after test, M = 50× (A-4) BC15 adsorbent after test, M = 2000× (B-1) BC18 adsorbent before test, M = 50× (B-2) BC18 adsorbent before test, M = 2000× (B-3) BC18 adsorbent after test, M = 50× (B-4) BC18 adsorbent after test, M = 2000×.