applied sciences

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Supplementary Material

Countercurrent Actinide Lanthanide Separation Process (ALSEP) Demonstration Test with a Simulated PUREX Raffinate in Centrifugal Contactors on the Laboratory Scale

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Table S1. Distribution ratios *D*, mass balances, and stage efficiencies in the extraction single centrifugal contactor test.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
	Distribution ratio *D*																						
5	23.54	45.92	21.85	25.04	0.82	0.10	0.09	6.63	0.34	0.32	0.03	0.34	0.52	0.30	0.03	0.03	2.61	6.21	11.23	17.42	36.60	40.01	27.41
10	14.45	33.75	14.56	17.49	0.53	0.02	0.02	4.36	0.16	0.34	0.01	0.06	0.10	0.05	≤0.01	≤0.01	1.46	3.57	6.36	9.90	22.96	26.01	16.50
15	12.16	28.12	10.98	13.61	0.22	0.01	0.02	2.41	0.08	0.19	≤0.01	0.01	0.04	0.04	≤0.01	≤0.01	1.37	3.19	5.52	8.77	21.00	22.60	14.23
25	12.24	26.92	10.88	12.85	0.13	0.01	0.02	3.03	0.12	0.22	≤0.01	0.01	0.05	0.04	≤0.01	≤0.01	1.32	3.09	5.36	8.56	18.71	20.07	13.21
35	12.16	25.88	10.01	11.85	0.44	0.01	0.02	4.20	0.20	0.28	≤0.01	0.01	0.07	0.05	≤0.01	≤0.01	1.34	3.08	5.27	7.90	14.64	14.96	10.07
45	11.69	25.09	8.71	10.19	4.02	0.01	0.02	4.35	0.18	0.31	0.01	0.01	0.07	0.05	≤0.01	≤0.01	1.30	3.06	5.17	8.03	18.36	21.30	14.67
49	11.71	24.32	9.18	10.47	0.74	0.01	0.02	2.46	0.09	0.19	≤0.01	≤0.01	0.04	0.03	≤0.01	≤0.01	1.31	3.01	5.12	8.03	16.60	18.33	12.46
Eq.	11.54	51.43	10.57	14.04	0.59	≤0.01	0.01	3.87	0.49	4.94	0.02	0.04	0.21	0.71	≤0.01	≤0.01	0.94	2.27	4.03	6.35	13.90	15.32	11.35
	Mass balance [%]																						
5	45	45	45	46	90	26	26	11	18	36	23	29	23	17	24	23	31	36	40	41	43	41	39
10	88	88	92	93	143	84	84	21	59	57	83	88	78	86	81	82	85	87	89	89	86	80	75
15	95	94	98	97	115	97	98	19	67	67	97	103	91	101	97	96	97	97	97	94	94	86	82
25	104	105	105	105	108	103	104	24	73	76	102	107	87	94	102	101	102	102	102	100	98	90	83
35	104	105	103	105	118	104	106	30	77	81	104	108	88	94	103	103	103	102	100	95	82	73	69
45	103	104	95	94	227	103	104	29	76	79	104	109	87	86	104	104	102	103	103	102	103	99	95
49	104	104	98	98	122	103	102	23	74	76	104	105	84	92	105	102	98	100	99	99	96	88	83
Eq.	103	119	108	112	91	100	101	33	66	49	101	105	80	32	100	99	97	100	104	105	115	110	101
	Stage efficiency (D_{SS}/D_{eq}) [%]																						
	102	47	87	75	126	192	152	64	19	4	30	11	21	4	70	150	139	133	127	126	119	120	110

Table S2. Feed concentrations, distribution ratios *D*, mass balances, and stage efficiencies in the Scrub 2 single centrifugal contactor test.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
	Concentration [Bq mL^{-1}]				**Concentration [mg L^{-1}]**																		
Org. feed	16904	35588	16234	14880	1.22	0.24	0.18	27.56	13.2	2.91	1.52	0.001	0.07	0.15	0.01	0.08	17.5	92.9	66.5	331.9	94.9	20.40	19.60
	Distribution ratio *D*																						
10	66.56	1394	56.79	81.56	1.79	0.97	0.66	2830	130.1	0.88	26.14	1.41	25.4	19.30	1.67	0.24	50.53	121.2	137.3	139.4	666	924	530
20	26.05	773.4	23.06	32.24	1.70	1.59	0.82	6435	207.1	0.22	13.18	10.25	66.5	43.48	1.49	1.11	21.76	51.6	56.5	61.6	362	787	362
30	21.99	671.8	19.91	28.23	6.33	0.65	0.43	6965	220.6	0.18	11.36	2.54	77.6	73.53	-0.20	0.54	15.86	39.4	43.9	47.9	284	647	291
40	21.49	641.3	19.32	26.97	2.15	4.96	1.30	5908	228.3	0.20	11.38	1.39	101.6	82.27	-0.44	1.97	16.22	42.1	46.3	50.3	312	664	304
50	22.12	629.4	18.59	26.15	1.18	0.65	0.29	4027	162.5	0.18	11.86	1.02	90.5	40.80	-1.10	0.44	16.14	40.2	45.9	47.7	299	633	279
60	21.76	645.2	18.81	26.34	2.68	0.45	0.29	4701	181.0	0.17	11.54	0.63	87.2	62.26	-0.46	0.24	15.35	38.0	44.7	49.3	289	623	286
70	21.52	619.0	18.26	26.19	1.79	0.33	0.19	3700	175.8	0.16	11.22	1.50	100.6	79.79	5.32	0.21	13.78	35.4	40.0	42.6	262	579	259
80	20.60	605.7	18.16	25.06	2.32	0.24	0.20	4580	173.9	0.16	10.83	1.29	112.2	76.13	-3.07	0.11	13.28	34.3	38.2	41.0	255	540	245
90	21.21	617.5	19.55	27.32	2.42	0.09	0.14	1571	155.9	0.18	10.67	1.10	127.1	73.07	1.10	0.08	13.54	35.5	41.5	43.7	258	593	263
100	21.28	621.3	19.25	27.55	0.79	0.02	0.07	558.7	118.2	0.15	9.71	0.86	80.2	36.31	5.69	0.03	13.86	35.6	41.4	43.1	263	561	251
110.5	21.08	592.2	18.59	25.92	1.70	6.74	0.90	>7000	155.6	0.29	7.53	0.80	87.6	64.17	0.98	1.42	13.55	34.7	39.4	42.3	256	530	261
Eq.	21.00	357.5	17.89	24.38	24.26	1.77	0.26	91.35	310.3	0.01	5.85	0.80	35.2	3.56	0.03	0.01	9.35	28.3	36.6	38.9	153	222	145

Table S2 continued.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
Mass balance [%]																							
10	57	62	62	64	200	16	47	72	123	56	63	291	122	125	99	17	62	64	62	60	60	60	57
20	94	100	105	105	151	19	49	123	211	167	113	298	192	206	74	19	110	107	103	102	103	106	101
30	99	104	113	114	413	15	45	120	281	217	128	113	233	266	24	9	113	108	106	106	104	105	105
40	100	106	118	118	169	41	66	122	272	216	122	261	220	253	19	15	116	115	111	112	109	109	106
50	102	106	113	114	127	15	48	114	190	210	125	272	172	187	4	8	112	110	110	106	107	106	105
60	102	106	116	118	175	12	42	113	219	206	120	253	190	213	50	8	112	108	108	109	106	106	103
70	101	105	108	110	139	15	48	113	233	223	126	246	201	231	-52	7	110	109	107	104	104	107	104
80	99	104	110	112	149	12	41	109	227	222	123	234	183	222	-36	8	107	107	104	102	103	103	99
90	103	106	117	116	216	34	67	101	198	214	117	232	158	200	-66	14	103	105	104	102	98	103	102
100	99	103	121	124	174	139	153	95	176	289	94	254	149	171	39	40	107	102	101	98	99	100	100
110.5	101	106	112	112	119	17	38	101	177	227	80	202	133	172	-79	10	106	106	103	102	101	98	101
Eq.	101	104	118	120	190	4	26	90	121	156	65	244	95	152	-200	147	102	106	105	102	101	100	104
Stage Efficiency (D_{eq}/D_{SS}) [%]																							
	100	58	94	92	1317	1540	187	4	208	8	56	74	33	6	2	10	69	81	91	91	59	39	57

Table S3. Feed concentrations, distribution ratios *D*, mass balances, and stage efficiencies in the An stripping single centrifugal contactor test.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
	Concentration [Bq mL^{-1}]				**Concentration [mg L^{-1}]**																		
Org. feed	7613	17718	7496	6975	0.23	0.09	0.03	11.92	3.51	0.37	0.20	<d.l.	0.03	0.04	<d.l.	0.003	9.11	50.66	36.03	170.23	47.12	9.87	9.42
	Distribution ratio *D*																						
10	2.89	72.90	2.59	2.86	0.90	12.00	1.08	1041.71	123.17	3.45	16.72	N/A	N/A	N/A	N/A	N/A	18.71	38.94	26.06	20.32	43.50	68.82	79.72
25	0.57	16.19	0.50	0.56	1.86	11.76	1.58	1422.16	7707.6	3.40	24.22	N/A	N/A	N/A	N/A	N/A	4.56	9.87	6.77	4.76	9.75	15.31	18.67
40	0.37	12.36	0.32	0.35	0.36	11.90	1.17	1364.64	> 1000	0.83	23.53	N/A	N/A	N/A	N/A	N/A	3.77	8.41	5.49	3.97	8.06	12.94	14.84
55	0.31	11.13	0.28	0.31	3.48	8.37	2.44	1324.58	> 1000	2.53	20.64	N/A	N/A	N/A	N/A	N/A	3.47	7.45	4.92	3.59	7.12	11.35	13.27
70	0.31	11.24	0.27	0.29	0.74	9.56	1.50	1282.29	> 1000	0.27	20.64	N/A	N/A	N/A	N/A	N/A	3.36	7.74	5.16	3.63	7.00	10.77	13.04
84	0.31	11.26	0.28	0.31	2.40	8.35	1.37	1256.10	> 1000	1.54	20.73	N/A	N/A	N/A	N/A	N/A	3.28	7.03	4.98	3.75	7.35	11.54	13.23
100	0.31	11.56	0.25	0.27	2.48	8.97	0.99	1245.23	> 1000	0.90	18.99	N/A	N/A	N/A	N/A	N/A	3.31	7.20	5.08	3.66	7.52	11.96	14.11
115	0.31	10.67	0.28	0.31	2.92	5.56	0.55	843.77	> 1000	1.25	16.88	N/A	N/A	N/A	N/A	N/A	3.11	6.92	4.73	3.35	6.60	10.15	12.02
125	0.29	10.51	0.31	0.34	0.50	2.74	0.32	756.94	> 1000	1.47	18.76	N/A	N/A	N/A	N/A	N/A	3.06	6.99	4.56	3.26	6.43	10.31	12.54
140	0.30	10.98	0.32	0.34	1.00	1.01	0.26	539.57	> 1000	0.57	17.05	N/A	N/A	N/A	N/A	N/A	2.99	6.89	4.55	3.26	6.43	10.17	11.72
Eq.	0.12	7.90	0.11	0.12	1.30	3.16	0.27	374.71	34.62	0.06	4.26	N/A	N/A	N/A	N/A	N/A	1.77	3.94	3.08	2.30	4.75	7.14	9.02

Table S3 continued.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
	Mass balance [%]																						
10	27	64	30	34	164	90	87	91	129	78	99	N/A	N/A	N/A	N/A	N/A	60	64	59	59	63	68	68
25	78	101	86	88	137	90	76	135	198	104	151	N/A	N/A	N/A	N/A	N/A	100	101	100	96	98	98	102
40	91	102	106	109	266	88	77	131	185	160	145	N/A	N/A	N/A	N/A	N/A	110	109	106	106	106	109	105
55	96	102	111	112	158	88	158	133	176	132	138	N/A	N/A	N/A	N/A	N/A	107	105	104	106	105	107	102
70	98	102	113	113	186	85	169	125	154	268	134	N/A	N/A	N/A	N/A	N/A	108	110	109	107	105	104	103
84	101	105	117	117	127	89	95	120	179	134	139	N/A	N/A	N/A	N/A	N/A	106	103	104	111	107	107	102
100	98	103	109	111	121	91	94	116	137	143	123	N/A	N/A	N/A	N/A	N/A	103	103	101	103	105	108	105
115	97	102	112	113	148	88	84	93	125	116	104	N/A	N/A	N/A	N/A	N/A	100	98	97	100	99	98	94
125	96	98	106	107	214	97	98	111	130	118	118	N/A	N/A	N/A	N/A	N/A	100	99	98	100	98	99	99
140	99	101	106	107	136	111	126	99	114	163	106	N/A	N/A	N/A	N/A	N/A	98	97	98	100	99	100	96
Eq.	72	89	83	83	125	87	96	99	138	86	119	N/A	N/A	N/A	N/A	N/A	74	78	78	80	85	88	89
	Stage Efficiency (D_{eq}/D_{SS}) [%]																						
	41	74	36	35	88	102	73	53	N/A	5	24	N/A	N/A	N/A	N/A	N/A	58	57	67	70	73	70	75

Table S4. Feed concentrations, distribution ratios *D*, mass balances, and stage efficiencies in the Ln re-extraction single centrifugal contactor test.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
	Concentration [Bq mL^{-1}]				Concentration [mg L^{-1}]																		
Aq. feed	8309	1400	9635	8799	0.53	0.01	0.03	0.01	<d.l.	0.22	0.01	<d.l.	0.01	<d.l.	<d.l.	0.01	2.45	6.30	6.43	43.31	6.49	0.89	0.69
Distribution ratio *D*																							
15	0.36	4.55	0.36	0.33	1.17	N/A	0.36	N/A	N/A	0.12	N/A	N/A	N/A	N/A	N/A	0.06	5.88	9.15	7.19	4.85	4.82	4.42	4.99
25	0.20	3.04	0.22	0.20	0.40	N/A	0.30	N/A	N/A	0.03	N/A	N/A	N/A	N/A	N/A	0.17	3.74	5.55	4.23	3.12	3.36	3.49	3.46
35	0.17	3.01	0.17	0.16	0.70	N/A	0.29	N/A	N/A	0.02	N/A	N/A	N/A	N/A	N/A	0.05	3.18	5.12	4.05	2.81	3.08	3.27	3.31
45	0.16	3.36	0.15	0.15	0.82	N/A	0.28	N/A	N/A	0.02	N/A	N/A	N/A	N/A	N/A	0.06	3.14	5.26	3.90	2.56	3.39	3.68	3.68
60	0.16	3.76	0.14	0.13	0.58	N/A	0.39	N/A	N/A	0.01	N/A	N/A	N/A	N/A	N/A	0.06	3.27	5.68	4.27	2.92	3.69	3.77	3.86
75	0.14	3.40	0.15	0.14	0.61	N/A	0.53	N/A	N/A	0.02	N/A	N/A	N/A	N/A	N/A	0.04	3.29	5.57	4.18	2.77	3.50	3.77	3.91
105	0.14	3.22	0.15	0.14	1.48	N/A	0.38	N/A	N/A	0.01	N/A	N/A	N/A	N/A	N/A	0.04	3.28	5.76	4.38	2.92	3.41	3.56	3.60
135	0.14	2.94	0.14	0.14	0.33	N/A	0.23	N/A	N/A	0.02	N/A	N/A	N/A	N/A	N/A	0.03	3.02	5.06	3.96	2.62	3.07	3.29	3.28
Eq.	0.13	7.72	0.12	0.13	1.34	N/A	0.22	N/A	N/A	0.02	N/A	N/A	N/A	N/A	N/A	0.03	2.20	4.45	3.61	2.76	5.20	7.84	7.25
Mass balance [%]																							
15	15	33	15	14	155	N/A	154	N/A	N/A	31	N/A	N/A	N/A	N/A	N/A	N/A	35	40	36	32	32	35	39
25	61	82	59	59	91	N/A	135	N/A	N/A	64	N/A	N/A	N/A	N/A	N/A	N/A	82	86	82	79	77	78	78
35	81	96	83	81	83	N/A	124	N/A	N/A	88	N/A	N/A	N/A	N/A	N/A	N/A	96	98	97	96	93	92	94
45	90	99	90	91	90	N/A	156	N/A	N/A	96	N/A	N/A	N/A	N/A	N/A	N/A	97	100	98	95	97	96	100
60	95	99	100	98	66	N/A	132	N/A	N/A	98	N/A	N/A	N/A	N/A	N/A	N/A	100	100	97	98	98	96	98
75	99	101	95	95	59	N/A	112	N/A	N/A	105	N/A	N/A	N/A	N/A	N/A	N/A	99	100	100	98	98	96	96
105	100	98	101	98	71	N/A	104	N/A	N/A	110	N/A	N/A	N/A	N/A	N/A	N/A	101	103	102	100	100	98	98
135	102	98	90	90	159	N/A	202	N/A	N/A	111	N/A	N/A	N/A	N/A	N/A	N/A	101	100	99	98	96	97	96
Eq.	100	186	100	101	80	N/A	109	N/A	N/A	92	N/A	N/A	N/A	N/A	N/A	N/A	107	126	122	121	151	176	170
Stage Efficiency (D_{eq}/D_{SS}) [%]																							
	106	41	119	112	60	N/A	170	N/A	N/A	63	N/A	N/A	N/A	N/A	N/A	N/A	145	123	116	100	64	45	50

Table S5. Distribution ratios *D* as a function of the HNO_3 and TEDGA concentrations in the Ln stripping batch tests.

HNO_3 [mol L^{-1}]	TEDGA [mol L^{-1}]	^{241}Am (γ)	^{244}Cm (α)	^{152}Eu (γ)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
Distribution ratio *D*																							
0.3	-	0.36	0.40	1.65	N/A	N/A	N/A	13.6	339	8.33	14.9	N/A	N/A	N/A	N/A	N/A	0.08	0.29	0.26	0.35	1.13	1.76	1.73
0.3	0.5	<0.01	<0.01	<0.01	N/A	N/A	N/A	0.03	37.7	32.7	16.4	N/A	N/A	N/A	N/A	N/A	0.08	0.02	0.01	0.008	0.01	0.01	0.02
0.4	-	0.37	0.33	1.47	N/A	N/A	N/A	5.90	306	9.66	14.2	N/A	N/A	N/A	N/A	N/A	0.09	0.29	0.25	0.35	1.11	1.62	1.48
0.4	0.5	<0.01	<0.01	<0.01	N/A	N/A	N/A	0.02	42.5	58.6	18.8	N/A	N/A	N/A	N/A	N/A	0.03	0.02	0.01	0.02	0.02	0.02	0.02
0.5	-	0.40	0.48	1.48	N/A	N/A	N/A	3.27	180	10.7	12.1	N/A	N/A	N/A	N/A	N/A	0.11	0.30	0.29	0.39	1.20	1.65	1.53
0.5	0.2	<0.01	<0.01	<0.01	N/A	N/A	N/A	<0.01	5.28	10.7	9.70	N/A	N/A	N/A	N/A	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
0.5	0.3	<0.01	<0.01	<0.01	N/A	N/A	N/A	<0.01	43.6	10.8	11.8	N/A	N/A	N/A	N/A	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
0.5	0.5	<0.01	<0.01	<0.01	N/A	N/A	N/A	<0.01	4.34	13.8	13.9	N/A	N/A	N/A	N/A	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.001
0.7	0.2	<0.01	<0.01	<0.01	N/A	N/A	N/A	<0.01	25.4	9.48	7.85	N/A	N/A	N/A	N/A	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
0.7	0.3	<0.01	<0.01	<0.01	N/A	N/A	N/A	<0.01	3.69	10.5	7.89	N/A	N/A	N/A	N/A	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.0	-	1.24	1.37	4.30	N/A	N/A	N/A	2.44	>1000	3.82	4.80	N/A	N/A	N/A	N/A	N/A	0.30	0.51	0.74	1.01	3.14	4.49	3.93
1.0	0.3	<0.01	<0.01	<0.01	N/A	N/A	N/A	<0.01	6.63	12.6	6.89	N/A	N/A	N/A	N/A	N/A	<0.01	<0.01	<0.01	<0.01	0.012	0.013	0.014

Table S6. Feed concentrations, distribution ratios *D*, mass balances, and stage efficiencies in the Ln stripping single centrifugal contactor test.

Run-time [min]	^{241}Am (γ)	^{152}Eu (γ)	^{241}Am (α)	^{244}Cm (α)	Fe	Rb	Sr	Y	Zr	Mo	Ru	Rh	Pd	Sn	Te	Cs	La	Ce	Pr	Nd	Sm	Eu	Gd
	Concentration [Bq mL^{-1}]				**Concentration [mg L^{-1}]**																		
Org. feed	2708	16126	2951	2933	0.36	0.07	0.02	13.95	5.127	0.44	0.45	<d.l.	0.03	0.054	<d.l.	<d.l.	7.66	44.09	30.68	147.54	43.47	9.42	8.84
	Distribution ratio *D*																						
10	0.24	0.21	0.26	0.26	1.79	6.10	0.63	0.17	> 100	14.20	> 100	N/A	2.87	N/A	N/A	N/A	0.20	0.31	0.22	0.23	0.24	0.23	0.23
20	0.18	0.16	0.19	0.20	2.37	7.85	0.51	0.14	> 100	24.89	> 100	N/A	3.68	N/A	N/A	N/A	0.16	0.23	0.18	0.19	0.19	0.18	0.17
30	0.16	0.14	0.16	0.16	6.95	6.42	0.40	0.12	> 100	22.72	> 100	N/A	3.81	N/A	N/A	N/A	0.15	0.21	0.16	0.16	0.16	0.14	0.15
35	0.17	0.16	0.20	0.20	3.47	5.37	0.40	0.14	> 100	22.81	> 100	N/A	3.49	N/A	N/A	N/A	0.16	0.23	0.17	0.19	0.19	0.18	0.18
40	0.19	0.17	0.21	0.21	6.86	7.77	0.78	0.13	> 100	22.60	> 100	N/A	3.92	N/A	N/A	N/A	0.17	0.24	0.19	0.19	0.20	0.20	0.19
50	0.20	0.18	0.26	0.25	3.50	10.55	0.64	0.14	> 100	18.50	> 100	N/A	2.57	N/A	N/A	N/A	0.16	0.22	0.18	0.18	0.19	0.18	0.20
60	0.19	0.18	0.23	0.23	1.30	11.59	0.52	0.13	> 100	19.24	> 100	N/A	4.55	N/A	N/A	N/A	0.17	0.25	0.19	0.19	0.19	0.19	0.18
65.5	0.21	0.20	0.23	0.22	2.20	8.89	0.49	0.14	> 100	19.02	> 100	N/A	3.36	N/A	N/A	N/A	0.18	0.26	0.20	0.22	0.20	0.19	0.20
Eq.	0.001	0.002	0.003	0.001	2.09	5.95	0.43	0.004	2.05	9.78	20.87	N/A	1.35	N/A	N/A	N/A	0.003	0.005	0.004	0.004	0.004	0.004	0.004
	Mass balance [%]																						
10	51	52	54	54	133	124	193	98	N/A	43	N/A	N/A	68	N/A	N/A	N/A	55	53	53	54	52	52	54
20	93	95	92	92	131	118	154	167	N/A	73	N/A	N/A	89	N/A	N/A	N/A	96	95	91	90	89	90	94
30	97	98	103	100	165	116	149	180	N/A	66	N/A	N/A	92	N/A	N/A	N/A	95	99	96	100	95	99	97
35	98	99	99	100	122	123	176	181	N/A	72	N/A	N/A	96	N/A	N/A	N/A	97	100	95	96	95	95	99
40	95	98	95	96	160	106	152	182	N/A	71	N/A	N/A	89	N/A	N/A	N/A	101	101	94	96	94	95	99
50	95	95	95	98	72	103	116	170	N/A	70	N/A	N/A	68	N/A	N/A	N/A	104	98	94	97	93	97	97
60	96	97	96	96	140	104	114	181	N/A	70	N/A	N/A	86	N/A	N/A	N/A	100	97	93	95	95	97	99
65.5	96	97	99	100	161	103	130	182	N/A	67	N/A	N/A	79	N/A	N/A	N/A	100	96	93	96	95	94	98
Eq.	86	89	79	80	169	119	178	164	56%	68	42%	N/A	73	N/A	N/A	N/A	90	86	81	84	82	82	88
	Stage Efficiency (D_{eq}/D_{SS}) [%]																						
	1	1	1	0	89	58	78	3	N/A	52	N/A	N/A	39	N/A	N/A	N/A	2	2	2	2	2	2	2

Table S7. *D* values used for the flowsheet calculations with the AMUSE code.

	***D* values**			
	at ss (last measured)		**Average during operation**	
	Extraction/Scrub 1	**Scrub 2**	**Extraction/Scrub 1**	**Scrub 2**
Am	9.2	18.6	9.95	18.9
Cm	10.5	24.4	11.8	26.6
La	1.3	14	1.33	14.6
Ce	3	35	3.09	37.2
Pr	5.1	39	5.28	42.4
Nd	8	42	8.26	45.3
Sm	16.6	256	17.9	275
Eu	24	592	26	627
Gd	12.5	261	12.9	271
Mo	0.19	0.2	0.24	0.18
Fe	0.7	1.7	0.38	2.37
Zr	0.09	155	0.13	175
Ru	0.01	7.5	0.01	10.7
Rb	0.01	0.24	0.01	0.35
Sr	0.01	0.14	0.02	0.23
Cs	0.01	0.08	0.01	0.23
Y	2.5	12000	3.29	4840
Rh	0.01	0.8	0.01	1.24
Pd	0.04	88	0.05	96
Sn	0.03	64	0.04	65.4
Te	0.01	0.98	0.01	0.87

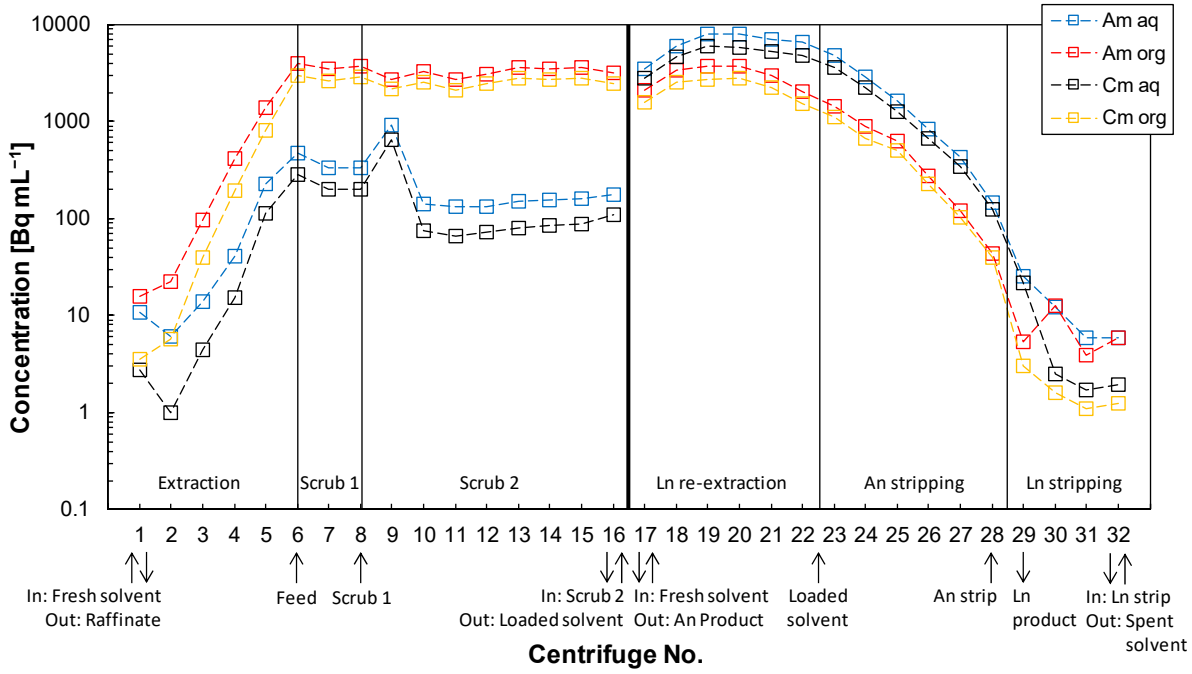

Figure S1. Am and Cm stage profiles of the Actinide Lanthanide Separation Process (ALSEP) demonstration test (data from alpha spectrometry).

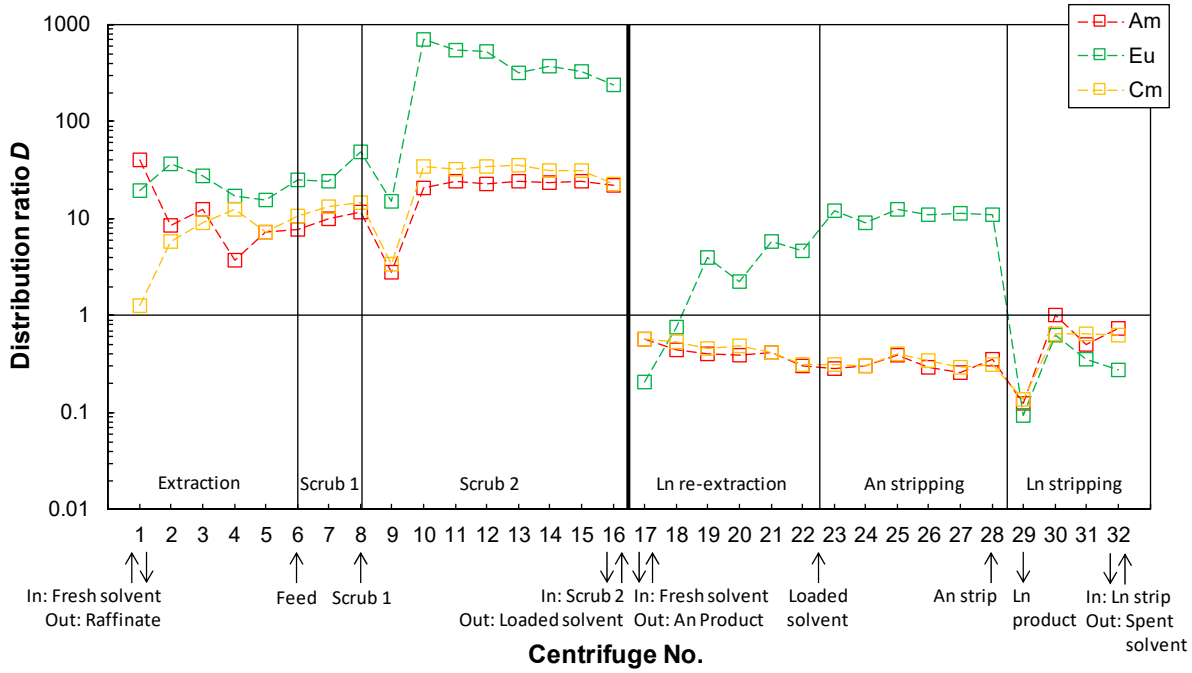

Figure S2. Am, Cm and Eu distribution ratios in the stages of the ALSEP demonstration test (Am, Eu data from ICP-MS measurements, Cm data from alpha spectrometry).

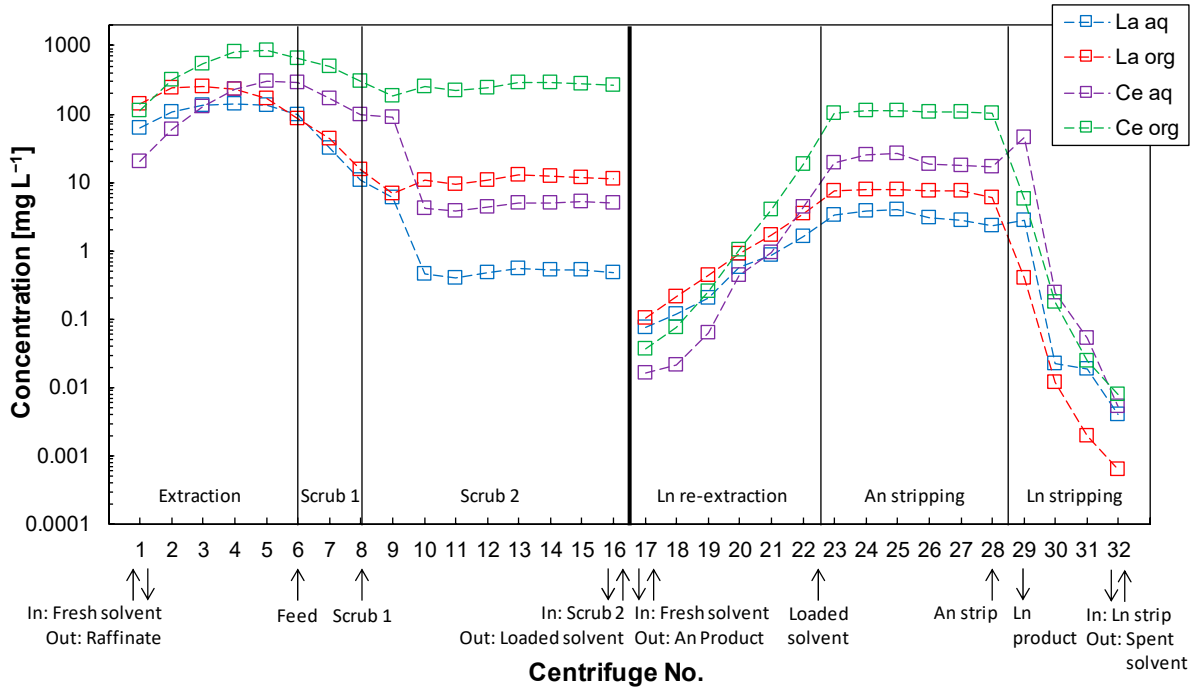

Figure S3. La and Ce stage profiles of the ALSEP demonstration test (data from ICP-MS measurements).

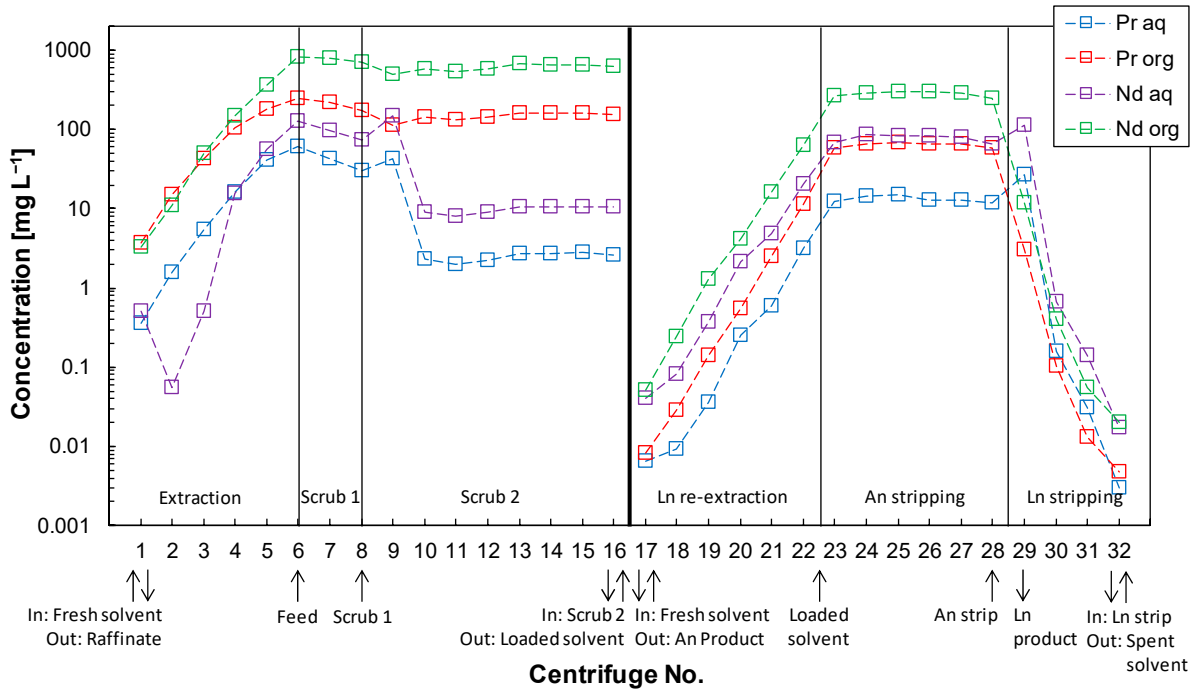

Figure S4. Pr and Nd stage profiles of the ALSEP demonstration test (data from ICP-MS measurements).

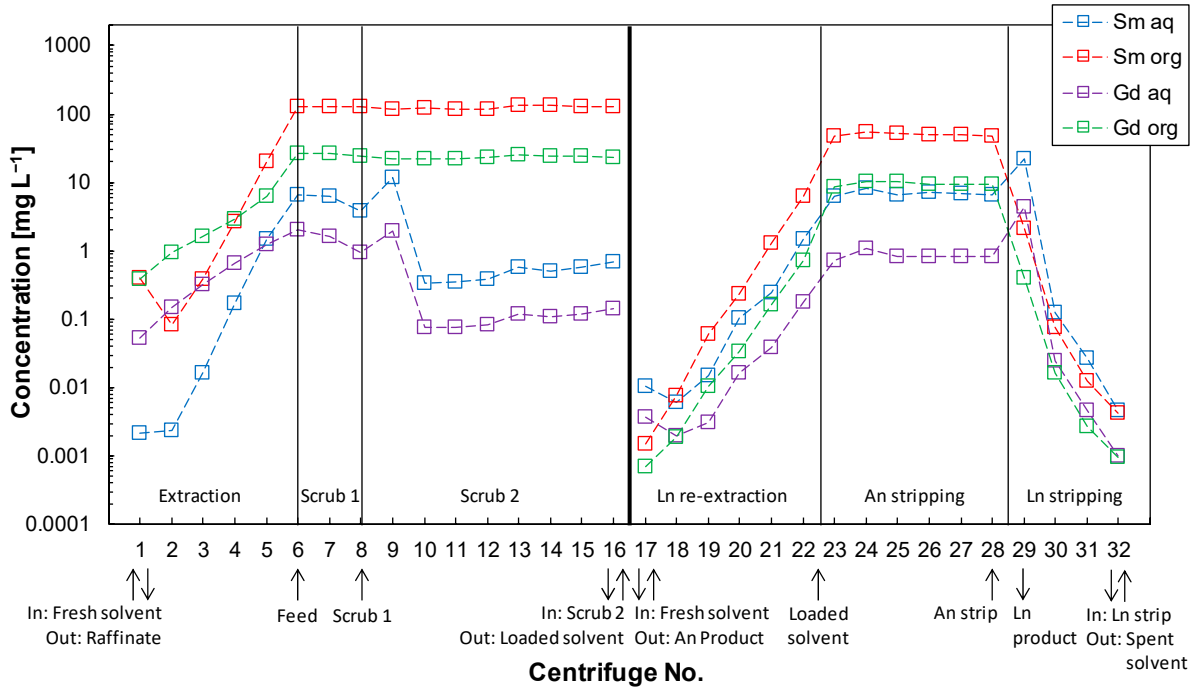

Figure S5. Sm and Gd stage profiles of the ALSEP demonstration test (data from ICP-MS measurements).