Supplementary Material

Process Evaluation of Fluorinated Ionic Liquids as F-Gases Absorbents

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Table S1. Calculated values used as input for pseudocomponent and property COSMOSAC specification in Aspen Plus v10.

Table S2. Calculated values used as input for pseudocomponent and property COSMOSAC specification in Aspen Plus v10.

Figure S1. HFC recovery as a function of the temperature using Equilibrium and Rate-Based mode of RADFRAC column at L/G=6 and 1 bar of partial pressure for the systems: **(a)** R-32-[C_2C_1Im][CF_3SO_3]; and **(b)** R-32-[C_2C_1py][$C_4F_9SO_3$].

Figure S2. HFC recoveries in Rate-Based mode as a function of L/G ratio (in mass units) at different total pressures on the absorption column in the complete process using R-134 as solute for the systems: **(a)** [C_2C_1Im][$N(CF_3SO_3)_2$]; and **(b)** [C_8C_1Im][$N(CF_3SO_3)_2$].

Figure S3. HFC recoveries in Rate-Based mode as a function of L/G ratio (in mass units) at different total pressures on the absorption column in the complete process using R-32 as solute for the systems: **(a)** [C_2C_1Im][$N(CF_3SO_3)_2$]; and **(b)** [C_8C_1Im][$N(CF_3SO_3)_2$].

Figure S4. Absorption column diameters as a function of L/G ratio (in mass units) and total pressure for R-32-[C_2C_1Im][CF_3SO_3] system.

Table S1. Calculated values used as input for pseudocomponent and property COSMOSAC specification in Aspen Plus v10 (1).

Property		C2C1ImC4F9CO2	C2C1ImC4F9SO3	C2C1ImC8F17SO3	C2C1ImCF3SO3	C2C1ImN(C2F5SO2)2	C2C1ImN(C4F9SO2)2
MW		374.20	410.26	610.29	260.24	491.33	691.36
Density, g/mL		1.41	1.45	1.55	1.35	1.48	1.56
CSACVL		374.75	399.96	547.60	282.13	463.18	607.95
NBP, K		1152.38	1315.23	1294.89	1201.73	1271.44	1225.59
Viscosity,	1 (A)	-8.62	-8.94	-	-5.83	-	-
MULAND	2 (B)	3954.74	4174.95	-	2852.84	-	-
Ref.		1	1		1		
SGPRF1-1	1	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00	0.00
	6	0.00	0.00	0.00	0.00	0.00	0.00
	7	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00
	9	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.01	0.01	0.03	0.03
	12	0.48	0.58	0.59	0.52	0.61	0.73
SGPRF2-1	1	1.93	2.25	2.30	2.03	2.43	2.48
	2	3.73	3.93	4.08	3.75	4.24	3.93
	3	4.47	4.35	4.54	4.22	4.60	4.38
	4	5.76	6.15	6.41	5.66	6.31	6.82
	5	9.73	10.77	11.03	9.80	10.23	10.78
	6	12.16	13.00	13.08	11.88	11.98	11.69
	7	12.14	13.42	13.45	11.89	13.29	13.05
	8	13.79	16.87	16.57	14.50	17.30	17.62
	9	16.98	20.12	19.89	17.94	20.61	20.40
	10	18.11	17.75	19.86	17.57	18.38	18.07
	11	14.90	12.13	16.78	13.35	12.76	14.65
	12	12.10	11.01	17.08	9.63	12.26	18.09
SGPRF3-1	1	15.59	16.64	30.75	9.36	19.57	33.43
	2	24.78	28.28	58.27	11.95	33.57	64.07
	3	34.06	39.51	68.68	14.69	46.98	81.94

	4	33.00	34.87	43.84	16.93	41.48	56.00
	5	21.32	17.25	16.60	16.19	20.57	20.07
	6	12.22	6.15	6.64	9.83	8.32	6.91
	7	7.68	4.14	4.41	3.95	5.23	4.12
	8	3.80	3.22	3.09	1.88	3.35	2.79
	9	2.12	1.68	1.52	1.63	3.64	3.21
	10	1.76	1.08	1.28	2.35	5.09	4.56
	11	1.58	1.60	1.98	3.25	8.52	8.93
	12	1.89	2.11	2.77	4.11	12.70	13.85
SGPRF4-1	1	2.21	3.25	5.02	5.30	12.87	13.10
	2	1.98	6.17	8.36	6.83	8.52	7.91
	3	1.95	9.57	10.41	8.15	3.52	2.98
	4	2.46	10.58	9.89	8.56	0.94	0.50
	5	3.60	7.61	6.20	6.17	0.28	0.00
	6	4.82	3.08	1.84	2.16	0.05	0.00
	7	4.67	0.54	0.09	0.19	0.00	0.00
	8	3.50	0.01	0.00	0.00	0.00	0.00
	9	2.08	0.00	0.00	0.00	0.00	0.00
	10	0.84	0.00	0.00	0.00	0.00	0.00
	11	0.19	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00
SGPRF5-1	1	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00	0.00
	6	0.00	0.00	0.00	0.00	0.00	0.00
	7	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00
	9	0.00	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00	0.00

Table S2. Calculated values used as input for pseudocomponent and property COSMOSAC specification in Aspen Plus v10 (2).

Property		C2C1ImN(CF3SO2)2	C2C1pyC4F9SO3	C8C1ImN(CF3SO2)2	C8H4F13ImN(CF3SO2)2	C8H4F13ImN(C2F5SO2)2
MW		391.31	421.28	575.49	809.36	709.35
Density, g/mL		1.42	1.46	1.33	1.58	1.61
CSACVL		385.34	411.70	588.23	703.87	616.63
NBP, K		1084.43	1357.40	1126.13	1354.67	1241.86
Viscosity, MULAND	1 (A)	-7.33	-12.79	-9.42	-12.15	-12.36
	2 (B)	3238.71	5408.33	4340.85	5861.66	5782.39
Ref.		[2]	[3]	[4]	[4]	[4]
SGPRF1-1	1	0.00	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00
	6	0.00	0.00	0.00	0.00	0.00
	7	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00
	9	0.00	0.00	0.00	0.00	0.07
	10	0.00	0.00	0.00	0.16	0.35
	11	0.02	0.11	0.02	0.70	1.01
	12	0.56	0.76	0.57	2.00	2.38
SGPRF2-1	1	2.22	1.63	2.20	4.94	4.85
	2	4.04	2.73	3.91	7.98	6.72
	3	4.31	5.29	4.31	9.17	7.41
	4	5.39	7.71	5.37	10.05	9.39
	5	8.86	8.21	8.34	10.82	10.81
	6	10.07	10.45	9.13	11.50	9.91
	7	10.30	14.71	8.83	12.36	10.33
	8	14.40	16.89	12.30	12.30	12.94
	9	18.89	17.81	18.69	11.99	14.02
	10	18.69	18.16	25.17	11.78	13.12
	11	15.41	17.30	30.51	13.55	14.88
	12	13.83	17.93	34.83	20.26	20.17
SGPRF3-1	1	16.85	22.37	38.41	37.22	33.74
	2	24.33	30.89	46.34	72.16	61.88

	3	33.13	38.92	58.66	97.29	81.76
	4	31.19	33.58	54.37	74.83	63.93
	5	15.81	16.65	30.69	31.83	27.50
	6	5.79	6.02	12.69	9.80	7.90
	7	4.58	4.09	5.49	5.24	3.84
	8	4.48	3.62	3.44	4.66	3.87
	9	5.47	2.59	4.44	4.77	5.62
	10	6.27	1.71	5.45	5.03	6.83
	11	7.95	1.97	8.72	7.63	9.27
	12	11.56	2.89	12.48	11.46	12.90
SGPRF4-1	1	12.40	4.89	11.38	11.87	12.67
	2	8.09	8.06	6.33	8.10	7.83
	3	2.79	9.93	1.81	3.31	2.56
	4	0.30	9.31	0.08	0.79	0.21
	5	0.00	6.07	0.00	0.19	0.00
	6	0.00	1.95	0.00	0.02	0.00
	7	0.00	0.12	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00
	9	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00
SGPRF5-1	1	0.00	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00
	6	0.00	0.00	0.00	0.00	0.00
	7	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00
	9	0.00	0.00	0.00	0.00	0.00
	10	0.00	0.00	0.00	0.00	0.00
	11	0.00	0.00	0.00	0.00	0.00
	12	0.00	0.00	0.00	0.00	0.00

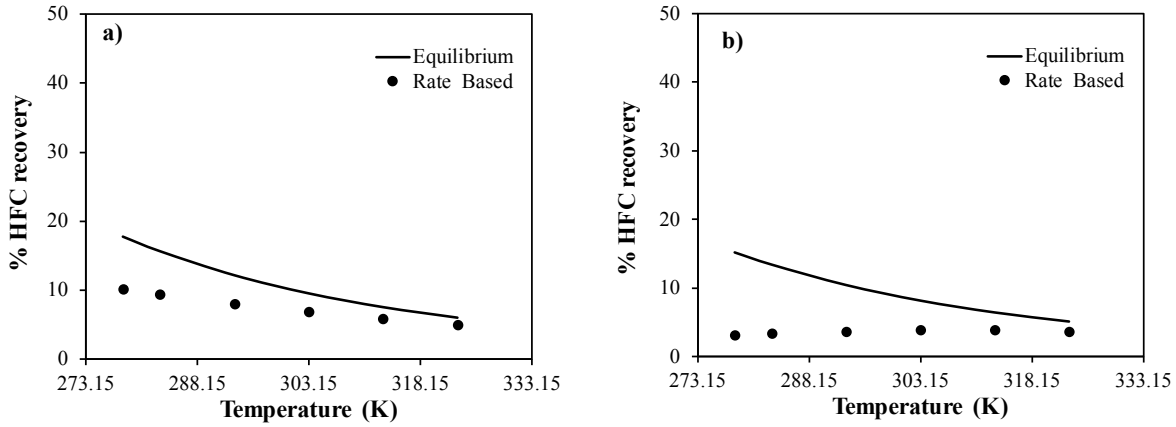

Figure S1. HFC recovery as a function of the temperature using Equilibrium and Rate-Based mode of RADFRAC column at L/G=6 and 1 bar of partial pressure for the systems: **(a)** R-32-[C_2C_1Im][CF_3SO_3]; and **(b)** R-32-[C_2C_1py][$C_4F_9SO_3$].

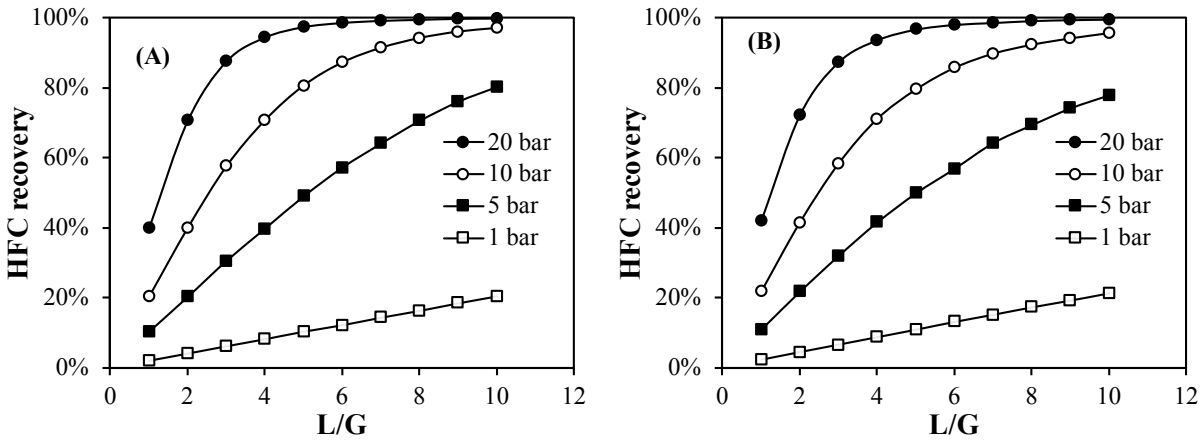

Figure S2. HFC recoveries in Rate-Based mode as a function of L/G ratio (in mass units) at different total pressures on the absorption column in the complete process using R-134 as solute for the systems: **(a)** $[C_2C_1Im][N(CF_3SO_3)_2]$; and **(b)** $[C_8C_1Im][N(CF_3SO_3)_2]$.

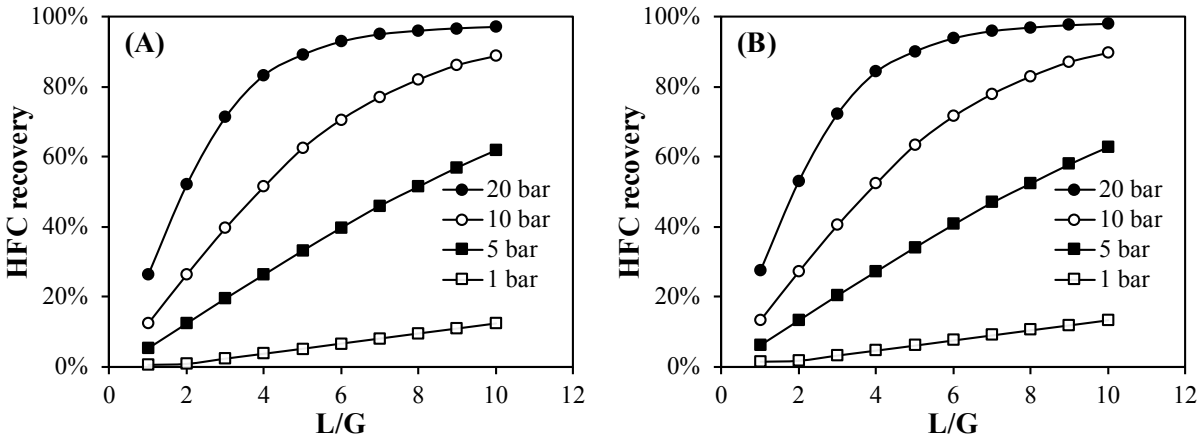

Figure S3. HFC recoveries in Rate-Based mode as a function of L/G ratio (in mass units) at different total pressures on the absorption column in the complete process using R-32 as solute for the systems: **(a)** $[C_2C_1Im][N(CF_3SO_3)_2]$; and **(b)** $[C_8C_1Im][N(CF_3SO_3)_2]$.

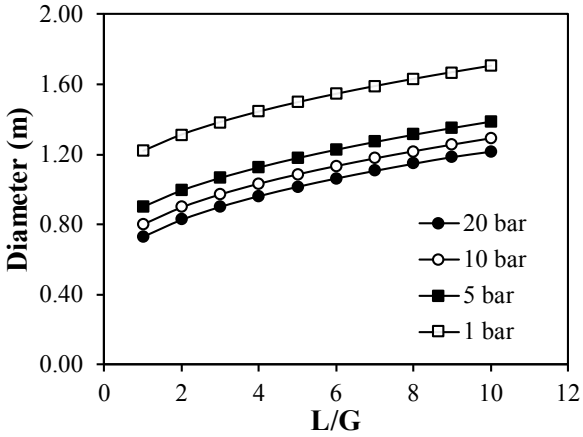

Figure S4. Absorption column diameters as a function of L/G ratio (in mass units) and total pressure for R-32-[C_2C_1Im][CF_3SO_3] system.

References

1. Vieira, N. S. M.; Reis, P. M.; Shimizu, K.; Cortes, O. A.; Marrucho, I. M.; Araújo, J. M. M.; Esperança, J. M. S. S.; Lopes, J. N. C.; Pereiro, A. B.; Rebelo, L. P. N., A thermophysical and structural characterization of ionic liquids with alkyl and perfluoroalkyl side chains. *RSC Advances* **2015,** *5* (80), 65337-65350.
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3. Pereiro, A.; Araújo, J.; Martinho, S.; Alves, F.; Nunes, S.; Matias, A.; Duarte, C.; Rebelo, L.; Marrucho, I., Fluorinated Ionic Liquids: Properties and Applications. *ACS Sustainable Chemistry & Engineering* **2013,** *1*, 427–439.
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