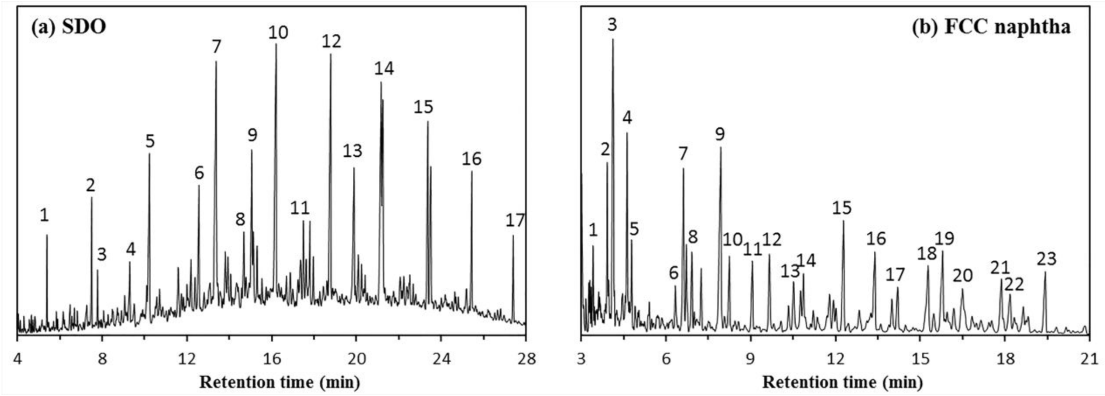

Figure S1 GC-MS spectra of the SDO and FCC naphtha

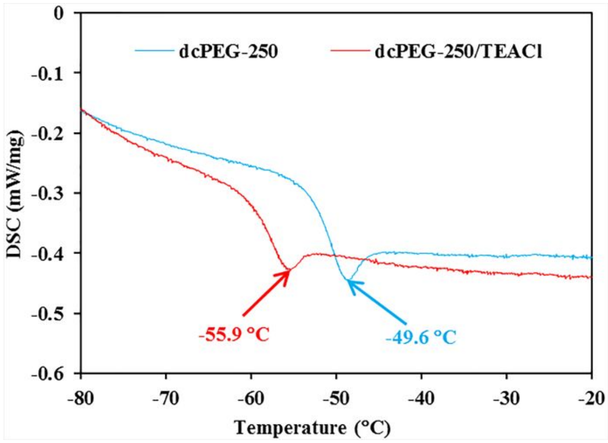

Figure S2 DSC thermograms of dcPEG and dcPEG-based DES

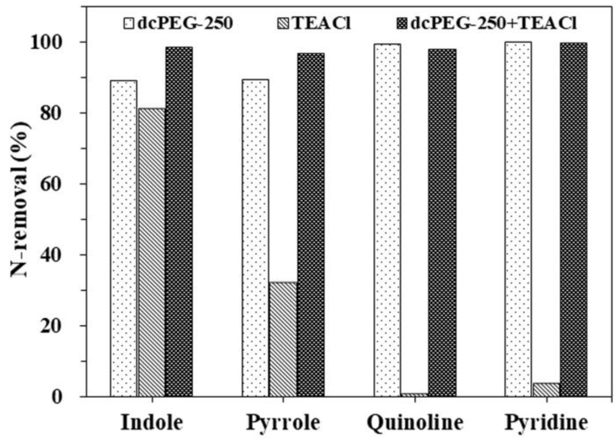

Figure S3 Comparison of denitrogenation among the extractants

(m_{Ex}/m_{oil} = 1/1 g/g; n_{TEACl}/n_{dcPEG} = 1/1 mol/mol; T = 30 °C; t = 15 min;

toluene-containing oil)

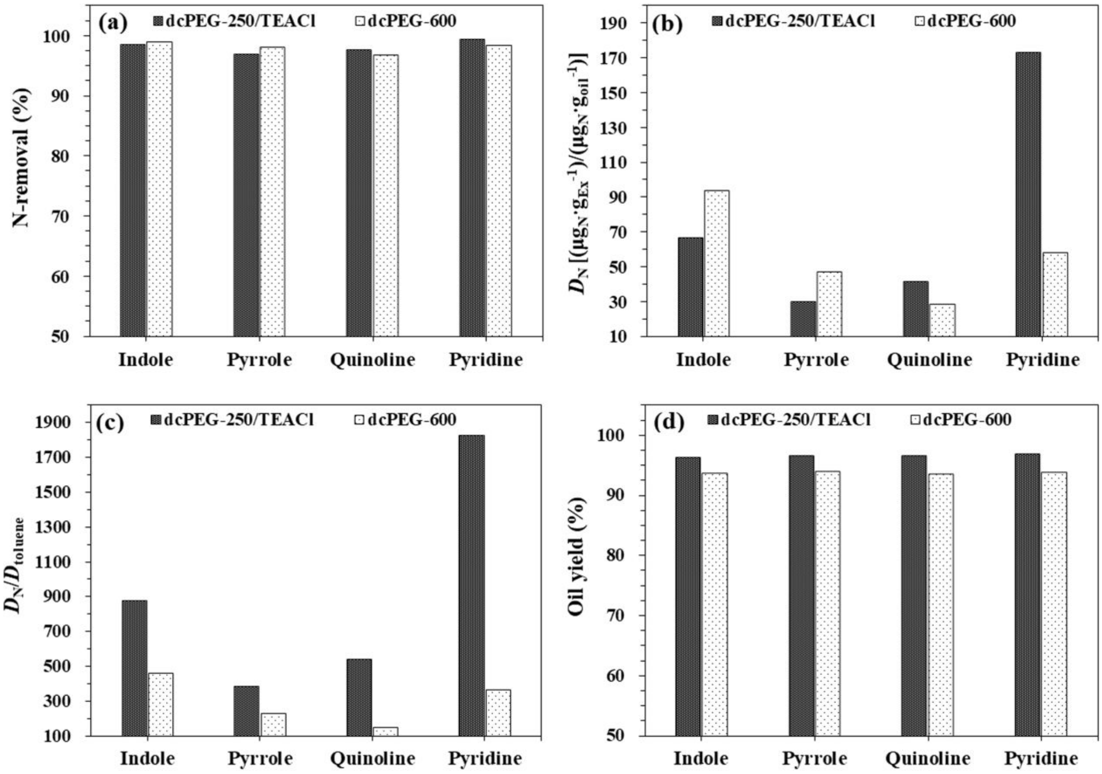

Figure S4 Comparison of performance between dcPEG-250/TEACl and dcPEG-600 (m_{Ex}/m_{oil} = 1/1 g/g; n_{TEACl}/n_{dcPEG} = 1/1 mol/mol; T = 30 °C; t = 15 min; toluene-containing oil)

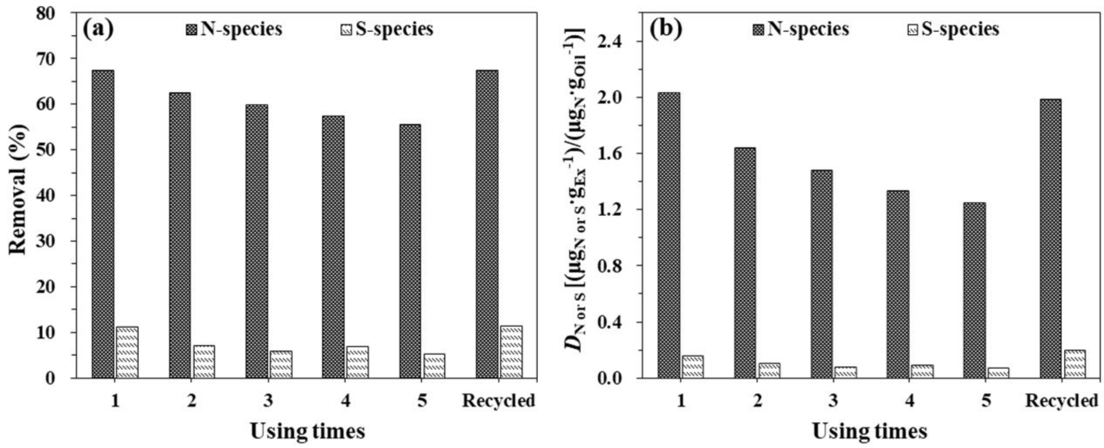

Figure S5 Performance comparison of dcPEG-250/TEACl between N-species and S-species in FCC naphtha

(m_{Ex}/m_{oil} = 1/1 g/g; n_{TEACl}/n_{dcPEG} = 1/1 mol/mol; T = 30 °C; t = 15 min)

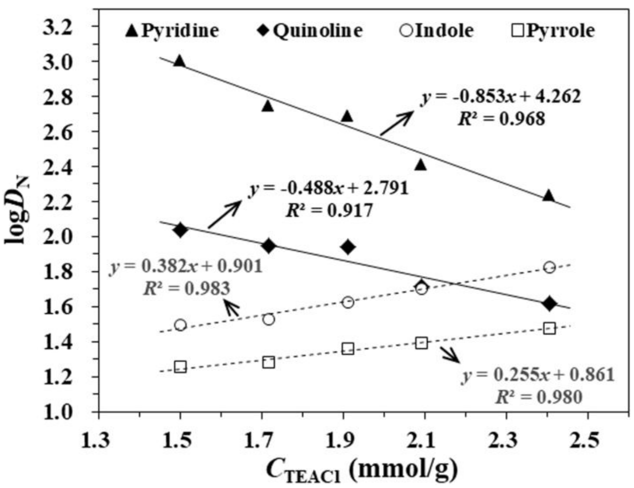

Figure S6 Mathematic relationship between performance parameter and C_{TEACl}

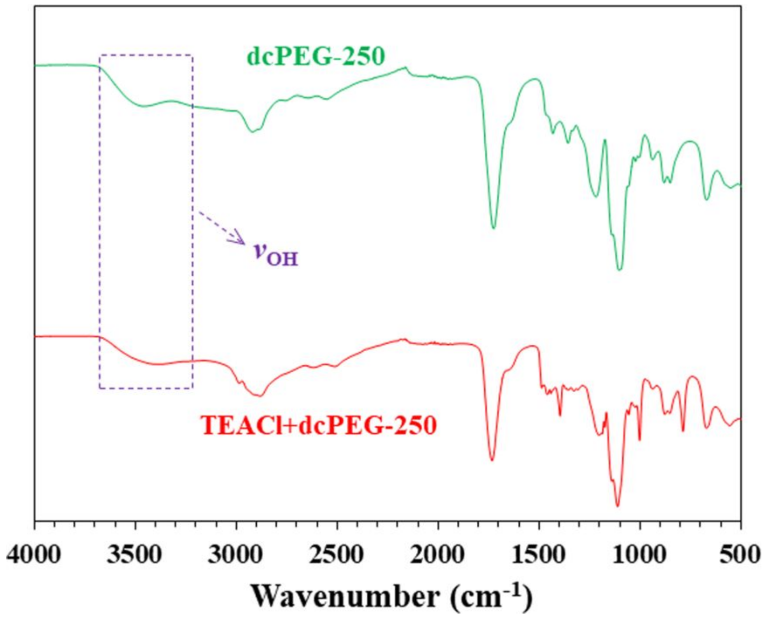

Figure S7 FT-IR spectra of dcPEG and dcPEG/TEACl

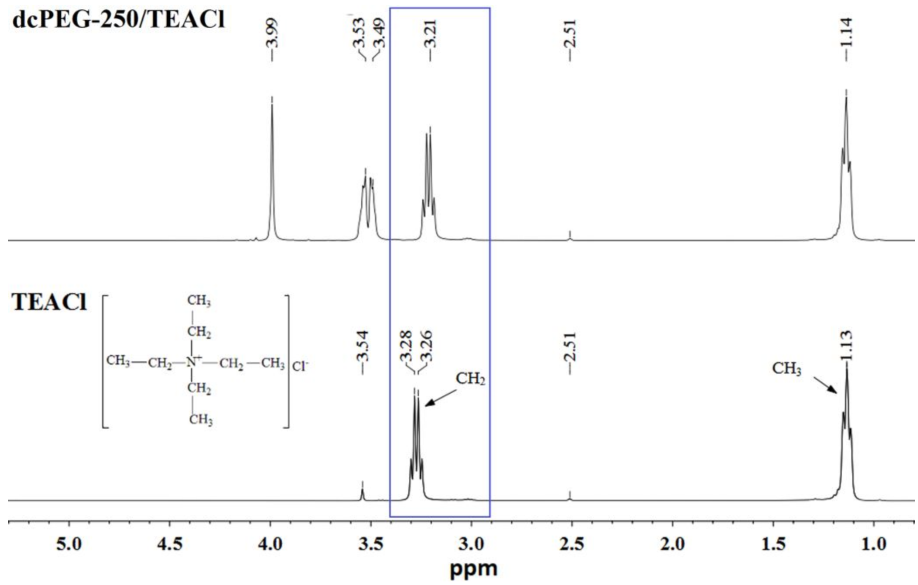

Figure S8 ^{1}H-MNR spectra of TEACl and dcPEG/TEACl

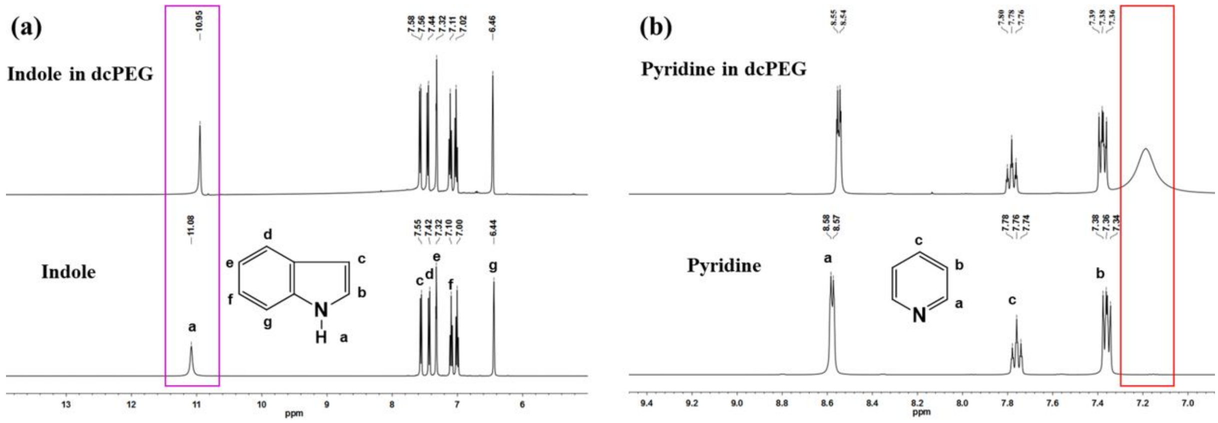

Figure S9 ^{1}H-NMR spectra for N-species with dcPEG-250 and sole N-species

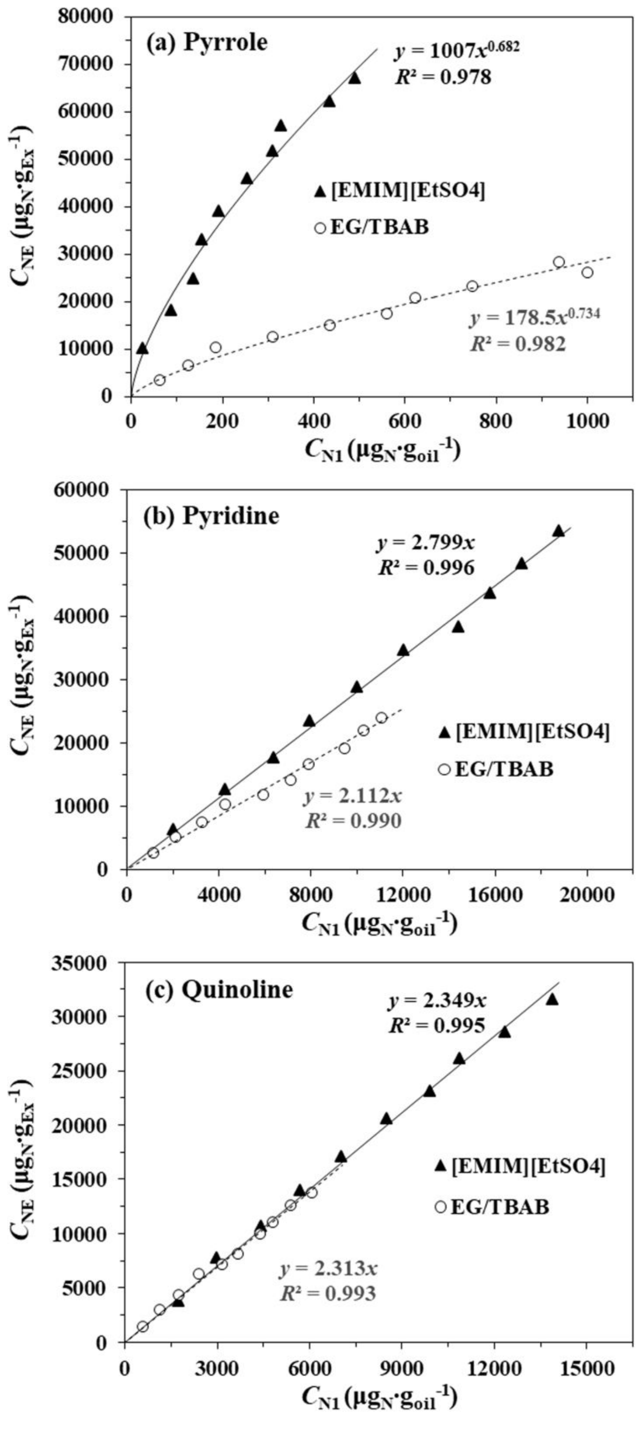

Figure S10 Freundlich-like relationship of C_{NE}-C_{N1} in literatures (T = 25°C; *n*-hexadecane)

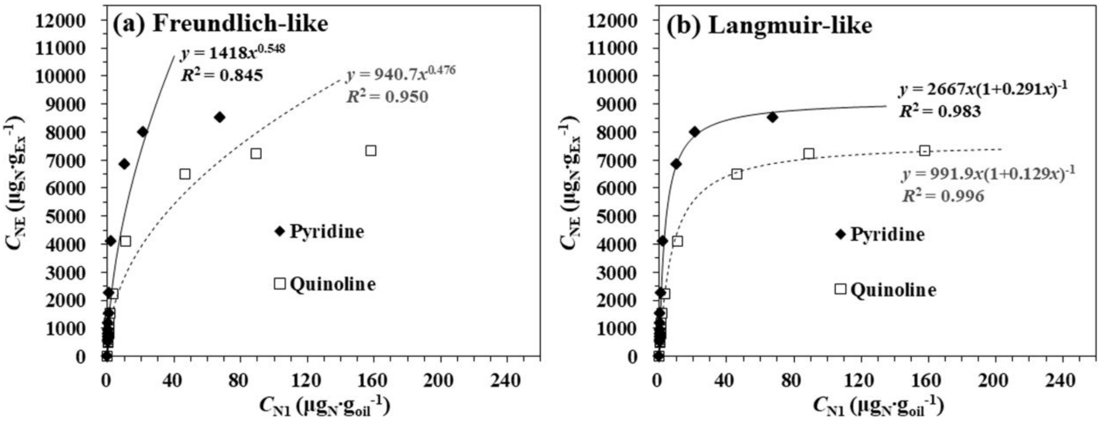

Figure S11 Comparison of correlation for dcPEG-250 between Freundlich-like and Langmuir-like relationships (T = 30 °C; toluene-containing oil)

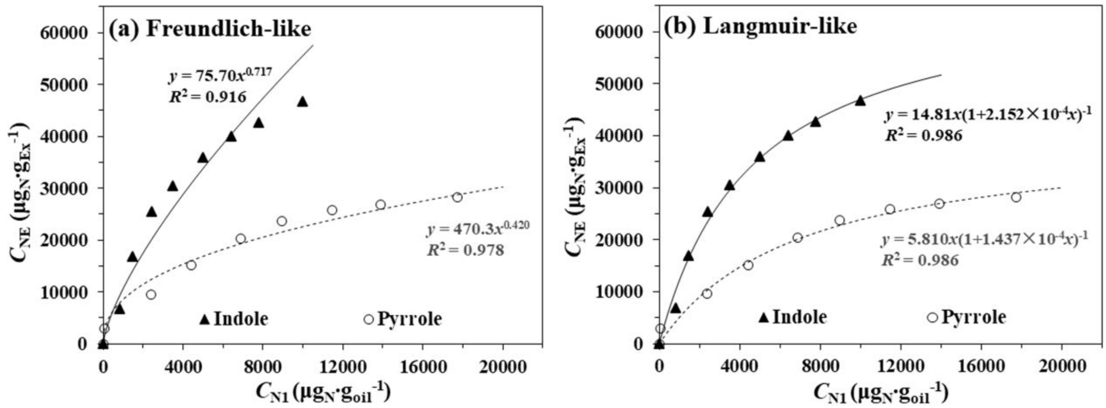

Figure S12 Comparison of correlation for [BMIM][TOS] between Freundlich-like and Langmuir-like relationships (T = 25 °C; pure toluene)

Table S1 Composition of SDO

Number	Name	Retention time (min)	Relative content (%)
1	Undecane	5.390	1.75
2	Dodecane	7.505	3.03
3	3,6-dimethylundecane	7.780	1.20
4	2,3,7-trimethyloctane	9.295	2.05
5	Tridecane	10.225	5.96
6	2,6,10-trimethyldodecane	12.560	4.52
7	Tetradecane	13.375	11.94
8	3-cyclohexyldodecane	14.685	2.24
9	2,6,10-trimethyltridecane	15.055	3.79
10	Hexadecane	16.210	12.60
11	4-cyclohexyltridecane	17.495	2.67
12	Hexadecane	18.785	10.96
13	2,6,10-trimethylpentadecane	19.885	5.89
14	Heptadecane	21.165	18.06
15	Octadecane	23.370	6.79
16	Nonadecane	25.440	4.22
17	Heneicosane	27.390	2.32

Note: original N-content = 92 ppm.

Table S2 Composition of FCC naphtha

Number	Name	Retention time (min)	Relative content (%)
1	1-ethyl-2-methylcyclopentene	3.420	2.04
2	Ethylbenzene	3.920	3.59
3	1,3-dimethylbenzene	4.125	12.39
4	1,2-dimethylbenzene	4.625	4.95
5	Nonane	4.780	1.95
6	Propylbenzene	6.330	1.81
7	1-ethyl-3-methylbenzene	6.615	7.02
8	1,3,5-trimethylbenzene	6.915	3.25
9	1,2,3-trimethylbenzene	7.940	11.70
10	Decane	8.240	3.16
11	1,2,4-trimethylbenzene	9.055	3.26
12	2,3-dihydro-1H-indene	9.660	3.99
13	1-methyl-3-propylbenzene	10.515	2.74
14	1-ethyl-2,3-dimethylbenzene	10.865	1.67
15	4-ethyl-1,2-dimethylbenzene	12.285	6.03
16	Undecane	13.390	3.97
17	1,2,4,5-tetramethylbenzene	14.200	2.18
18	2,3-dihydro-4-methyl-1H-indene	15.275	5.33
19	2,3-dihydro-4-methyl-1H-indene	15.790	5.07
20	1,2,3,4-tetrahydronaphthalene	16.495	4.61
21	Naphthalene	17.865	2.63
22	2,3-dihydro-1,6-dimethyl-1H-indene	18.175	2.68
23	Tridecane	19.430	3.99

Note: original N-content = 463 ppm.

Table S3 Viscosities of dcPEG-250/TEACl and dcPEG-250

Extractant	Temperature (°C)	Viscosity (mPa·s)
dcPEG-250	30	450.5
	50	141.6
dcPEG-250/TEACl	30	613.9
	50	175.2

Table S4 D_N of dcPEG-250 for four N-compounds

N-species	D_N [$(\mu g_N \cdot g_{Ex}^{-1})/(\mu g_N \cdot g_{oil}^{-1})$]
Indole	7.98
Pyrrole	8.15
Quinoline	153
Pyridine	1194

Conditions: m_{Ex}/m_{oil} = 1/1 g/g; T = 30 °C; t = 15 min; toluene-containing oil.

Table S5 Comparison of EDN among different extractants

Extractant	Oil	N-species	m_{Ex}/m_{oil}	D_N [f]	Ref.
dcPEG-250/TEACl [a]	*n*-Octane	Pyridine	1	269	-
	n-Octane	Indole	1	127	-
	n-Octane+toluene	Pyridine	1	173	-
	n-Octane+toluene	Indole	1	67	-
[BMIM][Cl] [b]	Dodecane	Pyridine	1	1.8	[1]
	Dodecane	Indole	1	21	[1]
[EMIM][$EtSO_4$] [c]	*n*-Hexadecane	Pyridine	1	3.1	[2]
	n-Hexadecane	Pyrrole	1	397	[2]
EG/TBAB [c]	*n*-Hexadecane	Pyridine	1	2.3	[3]
	n-Hexadecane	Pyrrole	1	52	[3]
PAA/ChCl [d]	*n*-Heptane	Pyridine	1	129	[4]
	n-Heptane	Carbazole	1	54	[4]
Sulfolane/$P(C_{16}H_{36})Br$ [c]	*n*-Heptane	Pyridine	1[e]	37	[5]
	n-Heptane	Carbazole	1[e]	17	[5]
[BMIM][$N(CN)_2$] [c]	*n*-Hexane+toluene	Pyridine	1	2.6	[6]
	n-Hexane+toluene	Carbazole	1	∞	[6]
[BMIM][HSO_4] [c]	*n*-Hexane+toluene	Pyridine	1	32	[7]
	n-Hexane+toluene	Carbazole	1	2.5	[7]

Note: a. T = 30°C; b. T = 60°C; c. T = 25°C; d. T = 35°C; e. volume ratio; f. unit is $(\mu g_N \cdot g_{Ex}^{-1})/(\mu g_N \cdot g_{oil}^{-1})$.

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