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APPENDICES

Appendix A: The Cloud Point Extraction Data

The cloud point extraction data are represented in Table A-1 and Table A-2 for alcohol ethoxylates and alkylphenol ethoxylates respectively.

Table A-1 The coacervate extraction data for alcohol ethoxylate surfactants.

AE surfactant	Fractional coacervate volume	[Surf] _{di} (mM)	[Surf] _{co} (mM)	[Tou] _{di} (ppm)	[Tou] _{co} (ppm)	Surfactant partition ratio	Toluene partition ratio
<u>At 60 °C</u>							
C ₁₂ E ₃	0.05	3.18	1339.59	16.12	1693.63	421.25	105.06
C ₁₂ E ₇	0.25	2.54	253.86	12.41	337.29	99.88	27.18
C ₁₂ E ₆ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C ₉ E ₆	0.15	4.52	456.77	16.82	514.13	101.05	30.56
C ₁₇ E ₆ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>At 70 °C</u>							
C ₁₂ E ₃	0.03	3.37	2224.27	9.56	3105.88	660.02	324.88
C ₁₂ E ₇	0.15	3.10	469.73	14.46	557.21	151.53	38.53
C ₁₂ E ₆ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C ₉ E ₆	0.09	2.46	786.11	18.15	867.27	319.56	47.78
C ₁₇ E ₆ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>At 80 °C</u>							
C ₁₂ E ₃	0.02	2.13	3395.40	8.65	3884.22	1594.08	449.04
C ₁₂ E ₇	0.13	2.74	491.00	13.92	564.33	179.20	40.54
C ₁₂ E ₆ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C ₉ E ₆	0.06	3.12	1059.56	24.19	1313.66	339.60	54.31
C ₁₇ E ₆	0.29	7.89	222.04	13.08	329.40	28.14	25.18

Note: * The solutions do not form a distinct phase boundary at studied conditions.

Table A-2 The cloud point extraction data for alkylphenol ethoxylate surfactants.

APE surfactant	Fractional coacervate volume	[Surf] _{di} (mM)	[Surf] _{co} (mM)	[Tou] _{di} (ppm)	[Tou] _{co} (ppm)	Surfactant partition ratio	Toluene partition ratio
<u>At 30 °C</u>							
C ₉ PhE ₄	0.06	3.79	1107.33	13.55	1454.38	292.17	107.34
C ₉ PhE ₅ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C ₉ PhE ₇	0.34	3.65	176.84	25.22	280.09	48.45	53.64
C ₈ PhE ₇	0.25	2.40	248.57	26.47	353.15	103.39	13.34
C ₁₂ PhE ₇ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>At 40 °C</u>							
C ₉ PhE ₄	0.05	3.63	1331.16	4.88	1903.44	367.72	390.05
C ₉ PhE ₅ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C ₉ PhE ₇	0.28	1.38	241.57	7.25	330.24	175.05	45.55
C ₈ PhE ₇	0.19	1.92	325.16	8.58	448.90	169.35	52.32
C ₁₂ PhE ₇ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>At 50 °C</u>							
C ₉ PhE ₄	0.04	3.52	1665.63	4.27	2394.14	473.19	560.69
C ₉ PhE ₅ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C ₉ PhE ₇	0.14	2.88	511.12	12.74	669.81	177.47	52.58
C ₈ PhE ₇	0.10	2.42	673.45	16.15	921.42	278.29	57.05
C ₁₂ PhE ₇ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>At 60 °C</u>							
C ₉ PhE ₄	0.03	2.98	2236.87	8.15	3069.82	750.63	376.67
C ₉ PhE ₅ *	0.49	1.92	149.18	7.13	177.8	77.70	24.94
C ₉ PhE ₇	0.10	1.58	627.58	11.09	816.29	397.20	73.61
C ₈ PhE ₇	0.09	1.92	767.87	10.5	896.72	399.93	85.43
C ₁₂ PhE ₇ *	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note: * The solutions do not form a clear cut phase boundary at studied conditions.

Appendix B: Toluene Properties

Toluene was discovered by Pelletier and Walther (1836), who obtained it by dry-distilling pine needles. Its name derived from Tolu balsam from which it was also isolated by distillation.

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

This compound is used to manufacture benzoic acid, benzaldehyde, benzene, phenol, caprolactam, linoleum, toluenediisocyanates (polyurethane resins), toluene sulfonates (detergents), artificial leather and fabric and paper coating. It is also used as an intermediate in the industrial preparation of trinitrotoluene.

Preparation

1. From the light oil fraction from coal-tar distillation.
2. From the C₇- fraction of catalytically cracked oil or from mineral oil by aromatisation at about 500°C (775 K) under pressure (catalytic reforming process).

Properties

Identifiers

CAS Number :	108-88-3
Chemical formula :	C ₇ H ₈
Structural formula :	C ₆ H ₅ – CH ₃
Synonyms :	Toluol; phenyl methane; Methylbenzol; methyl-Benzene; Monomethyl benzene; Methacide; Tolu-sol; antisla; Tol; Toluene.

Physical and chemical data

Molecular weight :	92.1402
Specific gravity :	0.8669
Density :	0.867 g/mL
Melting point :	-93 °C
Boiling point :	110.6 °C

Solubilities	:	Water	:	<1 mg/mL at 18 °C
		Metanol	:	≥100 mg/mL at 18 °C
Vapor pressure	:			40 mmHg at 31.8 °C
Refractive index	:			1.4968 at 20 °C
Vapor density	:			3.14
Flash point	:			4.4 °C.

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