

APPENDIX A

Molar Compositions of the Studied Oils

Table A1 Molar composition of Oil 1

Component	Mol%	Molecular weight	Liquid density g/cm ³
C3	0.010		
iC4	0.040		
nC4	0.331		
iC5	0.601		
nC5	1.212		
C6	3.466		
C7	8.484	92.5	0.735
C8	11.139	105.0	0.763
C9	8.504	119.0	0.788
C10	7.212	134.0	0.790
C11	5.930	148.0	0.793
C12	5.009	161.0	0.806
C13	5.139	175.0	0.821
C14	4.167	189.0	0.833
C15	4.057	203.0	0.838
C16	3.236	216.0	0.844
C17	3.306	233.0	0.839
C18	2.524	248.0	0.842
C19	2.685	260.0	0.852
C20+	22.769	466.0	0.928

Table A2 Molar Composition of Oil 2

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.111		
C3	1.219		
iC4	0.645		
nC4	2.820		
iC5	1.954		
nC5	3.324		
C6	5.529		
C7	9.900	92.8	0.731
C8	10.726	106.3	0.754
C9	7.151	120.9	0.772
C10	6.103	134.0	0.790
C11	5.116	148.0	0.793
C12	4.230	161.0	0.806
C13	4.502	175.0	0.821
C14	3.434	189.0	0.833
C15	3.273	203.0	0.838
C16	2.719	216.0	0.844
C17	2.850	233.0	0.839
C18	2.055	248.0	0.842
C19	2.316	260.0	0.852
C20+	20.022	544.0	0.934

Table A3 Molar Composition of Oil 3

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.336		
C3	1.319		
iC4	0.566		
nC4	1.741		
iC5	1.086		
nC5	1.471		
C6	2.680		0.664
C7	6.117	90.1	0.749
C8	8.552	102.0	0.778
C9	5.376	115.7	0.800
C10+	70.756	319.7	0.875

Table A4 Molar Composition of Oil 4

Component	Mol%	Molecular weight	Liquid density g/cm ³
C1	0.281		
C2	0.448		
C3	1.171		
iC4	0.503		
nC4	1.198		
iC5	0.809		
nC5	0.933		
C6	1.989		
C7	5.981	89.0	0.758
C8	9.859	100.7	0.789
C9	7.160	115.5	0.808
C10+	69.668	282.1	0.875

Table A5 Molar Composition of Oil 5

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.085		
C3	0.924		
iC4	0.394		
nC4	2.191		
iC5	1.446		
nC5	2.574		
C6	4.299		
C7	8.580	91.4	0.743
C8	8.681	105.0	0.764
C9	6.987	118.8	0.775
C10+	63.839	346.0	0.927

Table A6 Molar Composition of Oil 6

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.338		
C3	1.391		
iC4	0.502		
nC4	1.457		
iC5	0.849		
nC5	1.133		
C6	1.969		
C7	5.390	87.8	0.771
C8	7.660	99.9	0.796
C9	5.612	112.9	0.816
C10+	73.700	364.0	0.927

Table A7 Molar Composition of Oil 7

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.065		
C3	1.148		
iC4	0.637		
nC4	3.620		
iC5	2.131		
nC5	3.696		
C6	5.244		
C7	11.078	92.3	0.735
C8	11.161	106.1	0.751
C9	8.231	122.1	0.757
C10+	52.989	285.0	0.887

Table A8 Molar Composition of Oil 8

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.278		
C3	1.851		
iC4	0.973		
nC4	2.954		
iC5	1.913		
nC5	2.493		
C6	4.206		
C7	8.487	90.5	0.746
C8	10.516	102.5	0.774
C9	6.593	116.5	0.795
C10+	59.736	290.0	0.876

Table A9 Molar Composition of Oil 9

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.270		
C3	1.991		
iC4	1.204		
nC4	3.807		
iC5	2.748		
nC5	3.671		
C6	6.272		
C7	11.275	91.3	0.740
C8	13.179	103.4	0.768
C9	8.034	117.4	0.789
C10+	47.549	242.0	0.855

Table A10 Molar Composition of Oil 10

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.310		
C3	0.705		
iC4	0.374		
nC4	0.802		
iC5	0.517		
nC5	0.560		
C6	0.987		
C7	1.650	92.3	0.735
C8	1.422	107.1	0.755
C9	0.847	124.8	0.756
C10+	91.826	331.0	0.916

Table A11 Molar Composition of Oil 11

Component	Mol%	Molecular weight	Liquid density g/cm ³
C1	0.145		
C2	0.309		
C3	1.739		
iC4	0.520		
nC4	2.800		
iC5	1.611		
nC5	2.932		
C6	4.940		
C7	8.374	91.6	0.741
C8	8.504	105.5	0.759
C9	6.233	119.7	0.776
C10+	61.894	320	0.913

Table A12 Molar Composition of Oil 12

Component	Mol%	Molecular weight	Liquid density g/cm ³
C1	0.140		
C2	0.447		
C3	2.033		
iC4	0.848		
nC4	2.660		
iC5	1.615		
nC5	2.081		
C6	3.875		
C7	6.748	94.3	0.723
C8	8.573	106.9	0.752
C9	6.745	119.6	0.782
C10+	64.236	298.0	0.890

Table A13 Molar Composition of Oil 13

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.199		
C3	1.949		
iC4	0.791		
nC4	3.680		
iC5	1.995		
nC5	3.297		
C6	5.905		
C7	10.353	92.3	0.735
C8	11.002	106.3	0.754
C9	7.336	121.0	0.763
C10+	53.491	294.4	0.884

Table A14 Molar Composition of Oil 14

Component	Mol%	Molecular weight	Liquid density g/cm ³
C3	0.133		
iC4	0.133		
nC4	0.619		
iC5	0.498		
nC5	0.854		
C6	1.793		
C7	5.307	90.5	0.749
C8	7.286	104.0	0.768
C9	5.907	118.7	0.778
C10+	77.469	303.0	0.893

Table A15 Molar Composition of Oil 15

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.097		
C3	1.481		
iC4	1.249		
nC4	3.647		
iC5	2.917		
nC5	3.783		
C6	7.343		
C7	13.403	91.2	0.742
C8	15.163	103.4	0.769
C9	10.030	116.8	0.787
C10+	40.887	222.3	0.837

Table A16 Molar Composition of Oil 16

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.102		
C3	0.939		
iC4	0.660		
nC4	2.481		
iC5	2.126		
nC5	3.041		
C6	6.205		
C7	12.738	91.3	0.742
C8	15.831	103.7	0.768
C9	10.441	117.6	0.787
C10+	45.466	224.0	0.837

Table A17 Molar Composition of Oil 17

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.075		
C3	0.462		
iC4	0.273		
nC4	0.895		
iC5	0.721		
nC5	1.160		
C6	3.009		
C7	6.828	93.1	0.730
C8	9.325	106.0	0.755
C9	7.616	119.1	0.774
C10+	69.635	281.7	0.869

Table A18 Molar Composition of Oil 18

Component	Mol%	Molecular weight	Liquid density g/cm ³
C2	0.071		
C3	1.115		
iC4	0.589		
nC4	2.355		
iC5	1.512		
nC5	2.460		
C6	4.454		
C7	8.850	91.1	0.744
C8	10.447	104.4	0.765
C9	7.376	118.0	0.785
C10+	60.771	291.8	0.880

APPENDIX B

Viscosity data

Table B1 Viscosity data for Oil 1

Temperature (K)	Dynamic viscosity (mPa s)					
353.15	3.14					
343.15	3.80					
333.15	4.73					
323.15	5.94					
313.15	7.88					
	Viscosity (mPa s) at shear rate (s ⁻¹)					
	20	30	70	100	300	500
313.15	14.5	13.9	14.0	14.0	13.8	13.5
303.15	36.0	33.7	31.0	27.6	23.5	21.9
293.15	540	385	250	200	110	105
288.15	1180	870	510	390	195	180
283.15	2150	1600	860	650	310	235
278.15	3670	2800	1460	1070	495	380

Table B2 Viscosity data for Oil 2

Temperature (K)	Dynamic viscosity (mPa s)				
363.15	1.94				
353.15	2.31				
343.15	2.69				
333.15	3.35				
323.15	4.26				
313.15	5.54				
308.15	6.62				
	Viscosity (mPa s) at shear rate (s ⁻¹)				
	30	70	100	300	500
303.15	13.8	10.4	10.1	10.5	9.9
293.15	43.1	32.2	36.0	38.0	38.0
288.15	115	97.0	95.0	78.9	69.4
283.15	300	220	195	121	97.0
278.15	600	395	325	176	132
274.15	925	605	500	245	170

Table B3 Viscosity data for Oil 3

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	3.03			
343.15	3.65			
333.15	4.51			
323.15	6.15			
313.15	8.60			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
303.15	20.0	20.0	22.0	19.0
301.15	33.0	32.1	34.0	31.2
299.15	56.3	56.5	52.1	46.4
297.15	129	94.4	76.0	68.6
295.15	262	146	104	84.5
293.15	359	197	131	105
291.15	468	260	168	128
289.15	590	340	212	158
287.15	780	448	262	192
285.15	1043	595	329	233
280.15	1388	852	410	282
281.15	1830	1050	492	337
279.15	2326	1300	582	399
277.15	2610	1430	-	-
275.15	3628	1770	-	-
274.15	4100	1850	-	-

Table B4 **Viscosity data for Oil 4**

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	2.33			
343.15	2.60			
333.15	3.11			
323.15	3.88			
313.15	4.94			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
307.15	6.44	6.2	5.9	6.7
305.15	13.0	9.2	6.8	7.9
303.15	20.3	11.7	8.0	9.0
301.15	27.5	14.1	9.4	10.9
299.15	31.6	16.4	10.9	12.9
297.15	36.0	19.4	13.4	16.1
295.15	43.0	23.9	19.2	22.8
293.15	53.9	32.4	29.5	33.0
291.15	73.2	48.2	42.7	43.3
289.15	104	70.5	57.7	55.3
287.15	152	100	75.0	69.9
285.15	212	134	89.8	78.6
283.15	283	172	105	89.0
281.15	369	210	126	104
279.15	470	267	150	114
277.15	575	326	177	128
275.15	725	395	200	148

Table B5 **Viscosity data for Oil 5**

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	6.71			
343.15	7.80			
333.15	11.4			
323.15	14.9			
313.15	20.7			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
307.15	36.7	22.8	23.3	22.6
305.15	40.5	24.9	25.3	24.5
303.15	47.1	27.5	26.5	25.8
301.15	52.5	30.3	30.6	29.8
299.15	58.3	33.3	33.9	33.2
297.15	66.2	37.1	37.4	36.5
295.15	73.9	38.8	41.8	40.4
293.15	78.5	43.0	46.7	45.8
291.15	84.8	48.9	52.5	50.9
289.15	109	59.9	60.4	57.6
287.15	126	69.8	69.4	65.3
285.15	145	83.9	80.7	74.6
280.15	171	103	93.1	85.8
281.15	197	129	109	98.1
279.15	234	165	129	113
277.15	279	217	152	130
275.15	331	285	179	154
273.15	391	360	209	181

Table B6 Viscosity data for Oil 6

Temperature (K)	Dynamic viscosity (mPa s)		
353.15	7.05		
343.15	8.88		
333.15	11.8		
323.15	16.3		
313.15	24.3		
	Viscosity (mPa s) at shear rate (s^{-1})		
	100	300	500
307.15	41.2	34.1	36.1
305.15	45.9	40.4	41.2
303.15	54.9	48.6	48.8
301.15	65.8	59.6	59.0
299.15	82.4	75.4	74.6
297.15	104	99.2	97.4
295.15	140	131	129
293.15	187	174	168
291.15	263	226	211
289.15	353	284	255
287.15	473	353	312
285.15	618	429	-
280.15	782	526	-
281.15	967	621	-
279.15	1183	-	-
277.15	1426	-	-
275.15	1708	-	-

Table B7 **Viscosity data for Oil 7**

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	1.99			
343.15	2.74			
333.15	3.25			
323.15	3.94			
313.15	4.88			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
307.15	8.22	8.86	7.09	8.13
305.15	9.8	7.15	8.16	9.06
303.15	11.7	8.47	8.77	11.8
301.15	10.6	9.88	11.0	11.8
299.15	12.7	11.1	13.3	12.7
297.15	16.3	12.1	14.5	14.1
295.15	17.2	13.4	16.6	17.0
293.15	21.0	16.3	20.0	19.9
291.15	25.1	20.8	23.7	23.5
289.15	28.5	25.1	28.4	28.2
287.15	36.5	30.4	37.2	35.7
285.15	43.3	38.0	44.6	43.7
280.15	55.2	47.8	56.5	53.0
281.15	66.3	57.8	68.1	64.8
279.15	80.6	71.6	84.8	81.0
277.15	99.8	88.7	105	98.9
275.15	125	115	129	120

Table B8 **Viscosity data for Oil 8**

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	2.02			
343.15	2.34			
333.15	2.79			
323.15	3.55			
313.15	4.56			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
303.15	7.16	6.80	7.19	6.96
301.15	8.16	7.52	7.69	7.76
299.15	9.55	8.19	8.70	8.80
297.15	10.3	9.57	9.90	10.3
295.15	12.3	11.6	11.9	12.1
293.15	13.3	13.0	14.6	14.7
291.15	15.7	15.3	17.5	17.8
289.15	18.0	17.5	21.3	22.6
287.15	21.3	21.1	26.8	28.8

Table B9 **Viscosity data for Oil 9**

Temperature (K)	Dynamic viscosity (mPa s)	
353.15	0.96	
343.15	1.06	
333.15	1.24	
323.15	1.37	
313.15	1.59	
	Viscosity (mPa s) at shear rate (s ⁻¹)	
	300	500
303.15	3.24	3.19
301.15	3.54	3.23
299.15	3.75	3.35
297.15	3.80	4.00
295.15	4.47	4.15
293.15	5.11	4.54
291.15	5.29	4.97
289.15	5.61	5.73
287.15	5.58	6.52

Table B10 Viscosity data for Oil 10

Temperature (K)	Dynamic viscosity (mPa s)
353.15	7.89
343.15	10.52
333.15	13.82
323.15	20.21
313.15	28.94
303.15	45.47
	Viscosity (mPa s) at shear rate (s^{-1})
	30-500
298.15	70.8
293.15	96.1
288.15	122
283.15	167
278.15	241

Table B11 Viscosity data for Oil 11

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	3.56			
343.15	4.22			
333.15	5.01			
323.15	6.67			
313.15	8.47			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
305.15	24.7	16.4	14.6	13.5
303.15	31.2	18.1	16.0	15.1
301.15	34.3	20.9	18.1	17.0
299.15	39.2	24.6	20.5	19.5
297.15	42.9	26.6	23.1	22.3
295.15	46.7	31.0	25.8	25.7
293.15	53.6	33.9	29.1	29.6
291.15	60.1	40.4	33.2	34.9
289.15	68.0	45.9	33.8	42.9
287.15	80.6	53.4	45.7	52.6
285.15	92.8	65.7	55.0	66.1
283.15	117	80.8	66.7	82.7
281.15	124	98.7	81.4	101
279.15	155	121	97.1	121
277.15	184	150	118	146
275.15	223	184	141	176

Table B12 Viscosity data for Oil 12

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	2.49			
343.15	2.97			
333.15	3.61			
323.15	4.44			
313.15	6.03			
303.15	8.63			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
301.15	17.9	11.0	8.1	8.3
299.15	25.5	13.2	10.3	10.1
297.15	29.6	14.6	11.4	11.4
295.15	34.1	16.9	13.3	13.1
293.15	37.7	19.7	14.9	14.9
291.15	41.3	22.9	16.4	16.9
289.15	44.9	24.7	18.5	18.5
287.15	48.7	27.7	20.9	20.8
285.15	51.7	30.0	23.6	23.4
283.15	56.6	33.6	26.8	26.5
281.15	61.1	38.2	30.9	30.0
279.15	65.7	42.6	35.4	35.1
277.15	73.1	49.0	41.5	40.6
275.15	79.5	53.4	46.1	44.5
274.15	84.1	59.9	51.6	51.1

Table B13 Viscosity data for Oil 13

Temperature (K)	Dynamic viscosity (mPa s)		
353.15	1.92		
343.15	2.25		
333.15	2.63		
323.15	3.15		
313.15	3.91		
308.15	4.53		
	Viscosity (mPa s) at shear rate (s ⁻¹)		
	100	300	500
307.15	10.6	6.55	6.42
305.15	10.2	7.45	7.76
303.15	11.0	7.8	9.66
301.15	11.4	9.28	10.6
299.15	14.9	11.3	12.0
297.15	17.3	12.4	13.7
295.15	18.0	14.1	15.2
293.15	23.0	17.2	18.8
291.15	27.0	22.0	23.7
289.15	33.4	25.3	30.2
287.15	41.2	34.4	37.3
285.15	52.5	41.5	43.6
283.15	61.9	50.3	51.4
281.15	73.3	58.6	60.8
279.15	87.0	68.8	74.6
277.15	106	78.3	90.9
275.15	130	94.6	112
273.15	161	116	138

Table B14 . Viscosity data for Oil 14

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	3.21			
343.15	4.08			
333.15	5.07			
323.15	6.51			
313.15	8.27			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
307.15	11.3	11.5	13.1	12.2
305.15	14.7	12.9	13.8	13.1
303.15	15.7	13.2	15.7	14.0
301.15	16.7	14.2	16.3	14.6
299.15	19.3	14.4	18.9	16.6
297.15	20.3	18.3	19.8	19.3
295.15	21.2	19.6	24.3	22.1
293.15	25.3	23.9	27.1	25.7
291.15	28.9	27.7	30.5	32.3
289.15	33.6	33.4	37.8	43.5
287.15	40.9	41.6	45.1	53.7
285.15	49.2	49.3	55.4	64.7
283.15	59.8	63.5	67.6	76.0
281.15	71.9	78.9	81.0	87.8
279.15	87.7	95.8	98.7	105
277.15	110	120	122	126
275.15	134	148	149	152
273.15	159	179	180	187

Table B15 Viscosity data for Oil 15

Temperature (K)	Dynamic viscosity (mPa s)	
353.15	0.707	
343.15	0.737	
333.15	0.828	
323.15	0.943	
313.15	1.05	
308.15	1.21	
	Viscosity (mPa s) at shear rate (s ⁻¹)	
	300	500
303.15	1.41	1.29
301.15	1.47	1.34
299.15	1.54	1.39
297.15	1.60	1.43
295.15	1.71	1.51
293.15	1.77	1.57
291.15	1.87	1.65
289.15	1.98	1.72
287.15	2.09	1.80
285.15	2.24	1.91
283.15	2.37	2.04
281.15	2.53	2.19
279.15	2.77	2.34
277.15	3.07	2.62
275.15	3.54	3.01

Table B16 Viscosity data for Oil 16

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	0.75			
343.15	0.84			
333.15	0.94			
323.15	1.05			
313.15	1.24			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
303.15	2.45	2.14	1.90	2.20
301.15	2.62	2.23	1.96	2.32
299.15	2.77	2.39	2.07	2.54
297.15	3.39	2.55	2.12	2.64
295.15	3.58	3.11	2.20	2.95
293.15	3.86	3.55	2.37	3.15
291.15	3.90	3.62	3.01	3.38
289.15	4.45	3.70	3.07	3.83
287.15	4.56	3.98	3.15	4.07
285.15	4.62	4.04	3.34	4.45
283.15	4.81	5.00	4.19	5.77

Table B17 Viscosity data for Oil 17

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	2.17			
343.15	2.57			
333.15	3.12			
323.15	4.01			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
307.15	6.76	7.54	7.47	6.96
305.15	6.99	8.39	7.71	7.66
303.15	7.69	8.74	8.36	8.32
301.15	9.20	9.41	9.14	9.30
299.15	11.4	10.9	10.4	10.5
297.15	15.5	13.5	12.0	12.4
295.15	21.2	17.6	15.2	15.9
293.15	29.2	22.9	20.6	22.6
291.15	37.8	32.2	29.8	36.4
289.15	50.8	45.7	47.1	55.3
287.15	69.9	71.2	72.5	73.6
285.15	104	110	101	93.8
283.15	159	170	133	117
281.15	260	250	108	141
279.15	413	340	205	171
277.15	625	429	243	202
275.15	890	520	282	239
273.15	1139	618	323	279

Table B18 Viscosity data for Oil 18

Temperature (K)	Dynamic viscosity (mPa s)			
353.15	2.64			
343.15	3.03			
333.15	3.55			
323.15	4.22			
313.15	5.26			
303.15	6.95			
	Viscosity (mPa s) at shear rate (s ⁻¹)			
	30	100	300	500
301.15	9.44	8.18	6.71	6.57
299.15	15.9	10.4	7.94	7.80
297.15	21.0	12.6	9.63	9.51
295.15	26.9	16.0	11.8	11.7
293.15	34.3	21.0	15.1	15.0
291.15	45.3	28.9	20.8	20.3
289.15	58.1	39.3	28.4	26.8
287.15	74.7	50.7	37.0	33.8
285.15	92.5	63.9	45.6	41.9
283.15	111	78.6	55.7	53.2
281.15	138	93.1	69.1	67.9
279.15	169	108	86.4	83.1
277.15	210	131	109	93.5
275.15	272	157	134	121
274.15	380	176	150	132