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APPENDIX

A.1 Raw Measured and Fitted data for Lan Krabue Crude API = 14.1

- Calculation of pressure of fitted curve

By equation 4.1 gathered from MATLAB

$$f(x) = a \times \exp(b \times x) + c \times \exp(d \times x) \quad (4.1)$$

$$k_1 = \frac{-1}{b} \quad (4.2)$$

$$k_2 = \frac{-1}{d} \quad (4.3)$$

$$P(t) = m_1 \exp\left(-\frac{t}{k_1}\right) + m_2 \exp\left(-\frac{t}{k_2}\right) + P_{eq} \quad (2.10)$$

Table A.1A Raw data of Lan Krabue crude API 14.1 tested at $P_i = 300$ psi, $T = 30.46 \pm 0.26$ °C and 700 psi at $T = 30.39 \pm 0.19$ °C

$P_i = 300$ psi, $T = 30.46 \pm 0.26$ °C				$P_i = 700$ psi, $T = 30.39 \pm 0.19$ °C			
Time (hr)	Pressure (psi)	Temp (°C)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp (°C)	P fitted (psi)
0	300	30.8	286	0	700	30.5	675
1	286	30.8	285	1	679	30.1	671
2	285	31.0	285	2	670	30.2	667
3	285	30.9	284	3	663	30.4	663
4	284	30.4	284	4	658	30.3	659
5	284	30.9	284	5	653	30.4	655
6	283	30.8	283	6	649	30.4	652
7	282	30.6	283	7	644	30.4	648
8	282	29.8	282	8	642	30.3	645
9	281	30.6	282	9	639	30.2	642
10	280	30.8	282	10	635	30.2	639
11	279	30.2	281	11	632	30.3	636
12	279	30.4	281	12	630	30.4	633
13	279	29.9	280	13	628	30.3	630
14	279	30.7	280	14	625	30.4	627
15	279	30.8	280	15	623	30.4	624

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
16	278	30.4	279	16	621	30.1	622
17	278	30.3	279	17	618	30.1	619
18	278	30.0	279	18	616	30.4	616
19	277	29.8	278	19	614	30.1	614
20	277	30.7	278	20	614	30.3	612
21	276	30.2	278	21	611	30.2	609
22	276	30.0	277	22	609	30.7	607
23	276	31.2	277	23	607	30.5	605
24	276	29.8	277	24	604	30.6	603
25	275	30.8	276	25	600	30.2	601
26	275	30.6	276	26	595	30.5	599
27	274	30.8	276	27	595	30.0	597
28	274	30.0	275	28	593	29.8	595
29	274	30.3	275	29	590	30.3	594
30	275	29.6	275	30	588	30.6	592
31	274	30.4	274	31	586	30.4	590
32	274	30.2	274	32	583	30.5	589
33	274	30.4	274	33	581	30.5	587
34	273	30.6	273	34	579	30.5	586
35	273	30.4	273	35	576	30.4	584
36	273	30.7	273	36	576	30.4	583
37	273	30.2	273	37	576	30.5	581
38	273	30.5	272	38	576	30.3	580
39	273	30.6	272	39	576	30.7	579
40	272	30.5	272	40	574	30.7	577
41	272	30.1	271	41	574	30.5	576
42	272	30.2	271	42	572	30.8	575
43	272	30.4	271	43	572	30.7	574
44	271	30.5	271	44	572	30.7	573
45	270	30.7	270	45	572	30.1	571
46	270	30.5	270	46	569	30.6	570
47	270	30.5	270	47	567	30.2	569
48	270	30.7	270	48	567	30.3	568
49	270	30.7	269	49	567	30.2	567
50	268	30.6	269	50	565	30.9	566
51	268	30.7	269	51	565	30.4	565
52	268	30.8	269	52	565	30.6	565
53	268	30.8	268	53	565	30.4	564

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
55	268	30.6	268	55	562	30.8	562
56	268	30.7	268	56	562	30.8	561
57	268	30.5	267	57	560	30.7	561
58	268	30.7	267	58	560	30.0	560
59	267	30.7	267	59	560	30.6	559
60	267	30.6	267	60	560	30.6	558
61	266	30.3	266	61	558	30.2	558
62	266	30.5	266	62	558	30.2	557
63	266	30.5	266	63	558	30.4	556
64	266	30.7	266	64	558	30.4	556
65	266	30.4	266	65	558	30.4	555
66	266	30.8	265	66	555	30.4	554
67	265	30.0	265	67	555	30.4	554
68	264	30.0	265	68	555	30.0	553
69	264	30.5	265	69	555	30.0	553
70	264	30.5	265	70	555	30.0	552
71	264	30.6	264	71	555	30.3	552
72	264	30.6	264	72	555	30.2	551
73	264	30.7	264	73	553	30.5	551
74	264	30.9	264	74	553	30.3	550
75	264	31.0	264	75	553	30.3	550
76	264	30.8	263	76	553	30.3	549
77	264	31.0	263	77	553	30.5	549
78	264	30.4	263	78	551	30.8	548
79	264	30.5	263	79	551	30.7	548
80	263	30.8	263	80	551	30.5	548
81	263	30.4	262	81	551	30.7	547
82	263	30.5	262	82	551	30.4	547
83	263	30.4	262	83	548	30.3	547
84	263	30.4	262	84	548	30.5	546
85	263	30.3	262	85	548	30.7	546
86	262	30.3	262	86	548	30.6	545
87	261	30.4	261	87	548	30.2	545
88	261	30.5	261	88	548	30.3	545
89	262	30.5	261	89	548	31.0	544
90	261	30.5	261	90	548	30.3	544
91	261	30.6	261	91	548	30.3	544
92	261	30.4	260	92	548	30.3	544

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
93	261	30.2	260	93	546	30.4	543
94	261	30.2	260	94	546	30.6	543
95	261	30.3	260	95	546	30.4	543
96	260	30.4	260	96	546	30.5	542
97	259	30.6	260	97	546	30.3	542
98	258	30.6	260	98	544	30.0	542
99	258	30.6	259	99	544	30.1	542
100	258	30.6	259	100	544	30.1	541
101	258	30.6	259	101	544	30.4	541
102	258	30.6	259	102	544	30.1	541
103	258	30.7	259	103	544	30.2	541
104	258	30.6	259	104	544	30.3	541
105	258	30.9	258	105	544	30.2	540
106	258	30.8	258	106	544	30.3	540
107	258	31.0	258	107	544	30.5	540
108	258	30.0	258	108	541	30.3	540
109	258	30.6	258	109	541	30.5	540
110	258	30.6	258	110	541	30.4	539
111	258	30.4	258	111	541	30.4	539
112	258	30.4	257	112	541	30.3	539
113	258	30.6	257	113	541	30.9	539
114	256	30.6	257	114	541	29.9	539
115	256	30.3	257	115	541	30.3	538
116	256	30.2	257	116	541	30.1	538
117	256	30.9	257	117	541	30.1	538
118	256	30.5	257	118	541	30.3	538
119	256	30.4	257	119	539	30.6	538
120	256	30.5	256	120	539	30.1	538
121	256	30.4	256	121	539	30.1	538
122	256	30.6	256	122	539	30.6	537
123	256	30.7	256	123	539	30.6	537
124	256	30.5	256	124	539	30.6	537
125	256	30.7	256	125	539	30.6	537
126	256	30.4	256	126	539	30.6	537
127	256	30.5	256	127	539	30.6	537
128	255	30.5	255	128	539	30.6	537
129	255	30.7	255	129	539	30.5	536
130	255	30.0	255	130	539	30.5	536

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
131	255	30.1	255	131	539	30.3	536
132	255	30.6	255	132	539	30.3	536
133	255	30.1	255	133	539	30.2	536
134	255	30.2	255	134	539	30.3	536
135	254	30.5	255	135	539	30.3	536
136	254	30.5	255	136	539	30.3	536
137	254	30.8	254	137	539	30.1	535
138	254	30.5	254	138	539	30.3	535
139	254	30.5	254	139	539	30.2	535
140	254	30.4	254	140	539	30.3	535
141	254	30.6	254	141	539	30.2	535
142	254	30.5	254	142	537	30.5	535
143	254	30.2	254	143	537	30.5	535
144	254	30.4	254	144	537	30.5	535
145	254	30.5	254	145	537	30.6	535
146	253	30.5	253	146	537	30.2	535
147	253	30.4	253	147	537	30.2	534
148	253	30.6	253	148	537	30.5	534
149	253	30.8	253	149	537	30.5	534
150	253	30.6	253	150	537	30.7	534
151	253	30.9	253	151	537	30.5	534
152	253	30.6	253	152	534	30.8	534
153	253	30.4	253	153	534	30.9	534
154	253	30.5	253	154	534	30.8	534
155	253	30.5	253	155	534	30.5	534
156	253	30.7	252	156	534	30.4	534
157	252	30.0	252	157	534	30.5	534
158	252	30.1	252	158	534	30.4	533
159	252	30.6	252	159	534	30.4	533
160	252	30.1	252	160	534	30.4	533
161	252	30.2	252	161	534	30.4	533
162	252	30.5	252	162	534	30.3	533
163	252	30.4	252	163	534	30.3	533
164	252	30.2	252	164	534	30.3	533
165	252	30.2	252	165	534	30.4	533
166	252	30.3	252	166	534	30.3	533
167	252	30.4	251	167	534	30.5	533
168	252	30.6	251	168	534	30.5	533

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
169	252	30.8	251	169	532	30.6	533
170	252	30.2	251	170	532	30.6	533
171	251	30.4	251	171	532	30.3	532
172	251	29.9	251	172	532	30.7	532
173	251	30.7	251	173	532	30.7	532
174	251	30.8	251	174	532	30.7	532
175	251	30.4	251	175	532	30.6	532
176	251	30.3	251	176	532	30.7	532
177	251	30.0	251	177	532	30.5	532
178	251	29.8	251	178	532	30.6	532
179	251	30.7	251	179	532	30.6	532
180	251	30.2	250	180	532	30.5	532
181	251	30.0	250	181	532	30.7	532
182	251	31.2	250	182	532	30.5	532
183	251	29.8	250	183	532	30.5	532
184	251	30.8	250	184	532	30.5	532
185	251	30.6	250	185	532	30.6	532
186	250	30.8	250	186	532	30.5	531
187	250	30.0	250	187	532	30.2	531
188	250	30.3	250	188	532	30.2	531
189	250	30.2	250	189	532	30.3	531
190	249	30.2	250	190	532	30.3	531
191	249	30.3	250	191	530	30.0	531
192	249	30.4	250	192	530	30.2	531
193	250	30.6	249	193	530	30.5	531
194	249	30.6	249	194	530	30.4	531
195	249	30.6	249	195	530	30.4	531
196	249	30.6	249	196	530	30.5	531
197	249	30.2	249	197	530	30.6	531
198	249	30.5	249	198	530	30.5	531
199	249	30.6	249	199	530	30.4	531
200	249	30.5	249	200	530	30.5	531
201	249	30.1	249	201	530	30.5	531
202	249	30.2	249	202	530	30.2	530
203	249	30.4	249	203	530	30.5	530
204	249	30.5	249	204	530	30.5	530
205	249	30.7	249	205	530	30.5	530
206	249	30.5	249	206	530	30.4	530

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
207	249	30.5	248	207	530	30.2	530
208	249	30.7	248	208	530	30.2	530
209	249	30.7	248	209	530	30.2	530
210	248	30.6	248	210	530	30.1	530
211	249	30.4	248	211	530	30.4	530
212	248	30.6	248	212	530	30.2	530
213	248	30.6	248	213	530	30.4	530
214	248	30.3	248	214	530	30.4	530
215	248	30.2	248	215	530	30.6	530
216	248	30.9	248	216	530	30.5	530
217	248	30.5	248	217	530	30.3	530
218	248	30.4	248	218	530	30.5	530
219	248	30.5	248	219	530	30.3	529
220	248	30.4	248	220	530	30.6	529
221	248	30.6	248	221	530	30.3	529
222	248	30.7	248	222	530	30.6	529
223	248	30.5	248	223	530	30.4	529
224	248	30.4	247	224	530	30.4	529
225	248	30.2	247	225	530	30.4	529
226	248	30.2	247	226	527	30.6	529
227	248	30.3	247	227	527	30.9	529
228	248	30.4	247	228	527	30.5	529
229	248	30.6	247	229	527	30.6	529
230	248	30.6	247	230	527	30.6	529
231	247	30.6	247	231	527	30.4	529
232	247	30.6	247	232	527	30.4	529
233	247	30.4	247	233	527	30.7	529
234	247	30.2	247	234	527	30.7	529
235	247	30.4	247	235	527	30.5	529
236	247	30.6	247	236	527	30.6	529
237	247	30.4	247	237	527	30.6	528
238	246	30.7	247	238	527	30.5	528
239	246	30.2	247	239	527	30.3	528
240	246	30.5	247	240	527	30.3	528
241	246	30.6	246	241	525	30.4	528
242	246	30.5	246	242	525	30.4	528
243	246	30.1	246	243	525	30.4	528
244	247	30.2	246	244	525	30.6	528

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
245	247	30.4	246	245	525	30.7	528
246	246	30.5	246	246	525	30.4	528
247	246	30.5	246	247	525	30.6	528
248	246	30.7	246	248	525	30.5	528
249	246	30.7	246	249	525	30.1	528
250	246	30.6	246	250	525	30.4	528
251	246	30.3	246	251	525	30.4	528
252	246	30.5	246	252	525	30.4	528
253	246	30.5	246	253	525	30.6	528
254	246	30.7	246	254	525	30.7	528
255	246	30.4	246	255	525	30.6	528
256	246	30.8	246	256	525	30.6	527
257	246	30.0	246	257	525	30.6	527
258	246	29.9	246	258	525	30.3	527
259	246	30.7	246	259	525	30.3	527
260	246	30.8	246	260	525	30.3	527
261	246	30.4	245	261	525	30.3	527
262	246	30.3	245	262	525	30.3	527
263	246	30.5	245	263	525	30.4	527
264	246	30.5	245	264	525	30.3	527
265	246	30.7	245	265	525	30.6	527
266	246	30.2	245	266	525	30.5	527
267	246	30.0	245	267	525	30.6	527
268	246	31.2	245	268	525	30.5	527
269	246	29.8	245	269	525	30.5	527
270	246	30.8	245	270	525	30.5	527
271	246	30.6	245	271	525	30.5	527
272	246	30.8	245	272	525	30.6	527
273	245	30.0	245	273	525	30.4	527
274	245	30.3	245	274	525	30.5	527
275	245	30.2	245	275	525	30.5	526
276	245	30.2	245	276	525	30.1	526
277	245	30.3	245	277	525	30.4	526
278	245	30.4	245	278	525	30.7	526
279	245	30.6	245	279	525	30.5	526
280	245	30.8	245	280	525	30.4	526
281	245	30.2	245	281	525	30.1	526
282	245	30.4	244	282	525	30.1	526

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
283	244	29.9	244	283	525	30.1	526
284	244	30.7	244	284	525	30.1	526
285	244	30.2	244	285	525	30.1	526
286	244	30.4	244	286	525	30.1	526
287	244	30.3	244	287	525	30.1	526
288	244	30.0	244	288	525	30.2	526
289	244	29.8	244	289	525	30.2	526
290	244	30.7	244	290	525	30.3	526
291	244	30.2	244	291	523	30.5	526
292	244	30.7	244	292	523	30.5	526
293	244	30.2	244	293	523	30.5	526
294	244	30.2	244	294	523	30.4	525
295	244	30.2	244	295	523	30.5	525
296	244	30.2	244	296	523	30.5	525
297	244	30.4	244	297	523	30.5	525
298	244	29.9	244	298	523	30.7	525
299	244	30.3	244	299	523	30.5	525
300	244	30.3	244	300	523	30.7	525
301	244	30.3	244	301	523	30.7	525
302	244	30.3	244	302	523	30.7	525
303	244	30.5	244	303	523	30.6	525
304	244	30.2	244	304	523	30.5	525
305	244	30.5	244	305	523	30.5	525
306	244	30.6	243	306	523	30.5	525
307	244	30.5	243	307	523	30.2	525
308	244	30.1	243	308	523	30.2	525
309	244	30.2	243	309	523	30.3	525
310	243	30.4	243	310	523	30.1	525
311	243	30.5	243	311	523	30.1	525
312	243	30.7	243	312	523	30.4	525
313	243	30.5	243	313	523	30.3	524
314	243	30.5	243	314	523	30.3	524
315	243	30.7	243	315	523	30.4	524
316	243	30.7	243	316	523	30.5	524
317	243	30.6	243	317	523	30.4	524
318	243	30.7	243	318	523	30.3	524
319	243	30.8	243	319	523	30.3	524
320	243	30.8	243	320	523	30.3	524

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
321	243	30.7	243	321	520	30.4	524
322	243	30.6	243	322	520	30.4	524
323	243	30.5	243	323	520	30.4	524
324	243	30.7	243	324	520	30.5	524
325	243	30.4	243	325	520	30.5	524
326	242	30.8	243	326	520	30.5	524
327	242	30.0	243	327	520	30.6	524
328	241	29.9	243	328	520	30.4	524
329	241	30.7	243	329	520	30.4	524
330	241	30.8	243	330	520	30.4	524
331	241	30.4	242	331	520	30.3	524
332	241	30.3	242	332	520	30.3	524
333	241	30.5	242	333	520	30.2	523
334	241	30.5	242	334	520	30.2	523
335	241	30.7	242	335	520	30.4	523
336	241	30.5	242	336	520	30.5	523
337	241	30.7	242	337	520	30.5	523
338	241	30.7	242	338	520	30.7	523
339	241	30.6	242	339	520	30.4	523
340	241	30.3	242	340	520	30.4	523
341	241	30.5	242	341	520	30.4	523
342	241	30.5	242	342	520	30.3	523
343	241	30.7	242	343	520	30.5	523
344	240	30.4	242	344	520	30.5	523
345	240	30.8	242	345	520	30.5	523
346	240	30.0	242	346	520	30.5	523
347	240	30.0	242	347	520	30.5	523
348	240	30.5	242	348	520	30.5	523
349	240	30.5	242	349	520	30.6	523
350	240	30.6	242	350	520	30.7	523
351	240	30.6	242	351	520	30.4	523
352	240	30.7	242	352	520	30.4	522
353	240	30.5	242	353	520	30.3	522
354	240	30.2	242	354	520	30.6	522
355	240	30.5	242	355	520	30.6	522
356	240	30.6	242	356	520	30.5	522
357	241	30.5	242	357	520	30.1	522
358	241	30.1	241	358	520	30.1	522

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
359	240	30.2	241	359	520	30.3	522
360	240	30.4	241	360	519	30.1	522
361	240	30.5	241	361	519	30.2	522
362	240	30.7	241	362	519	30.6	522
363	241	30.5	241	363	519	30.4	522
364	241	30.2	241	364	519	30.0	-522
365	240	30.2	241	365	519	30.3	522
366	240	30.3	241	366	519	30.6	522
367	240	30.4	241	367	519	30.3	522
368	240	30.6	241	368	519	30.5	522
369	240	30.6	241	369	519	30.5	522
370	240	30.6	241	370	519	30.5	522
371	240	30.6	241	371	519	30.5	522
372	241	30.4	241	372	519	30.3	521
373	241	30.2	241	373	519	30.3	521
374	240	30.4	241	374	519	30.5	521
375	240	30.6	241	375	519	30.5	521
376	240	30.4	241	376	519	30.5	521
377	240	30.7	241	377	519	30.4	521
378	240	30.2	241	378	519	30.4	521
379	241	30.5	241	379	519	30.4	521
380	241	30.6	241	380	519	30.5	521
381	241	30.5	241	381	519	30.6	521
382	241	30.1	241	382	519	30.4	521
383	240	30.2	241	383	519	30.6	521
384	240	30.4	241	384	519	30.4	521
385	240	30.5	241	385	519	30.5	521
386	240	30.5	241	386	519	30.4	521
387	240	30.7	240	387	519	30.2	521
388	240	30.7	240	388	519	30.2	521
389	240	30.6	240	389	519	30.3	521
390	241	30.3	240	390	519	30.1	521
391	241	30.6	240	391	519	30.1	520
392	241	30.7	240	392	519	30.4	520
393	241	30.5	240	393	519	30.3	520
394	241	30.4	240	394	519	30.3	520
395	240	30.2	240	395	519	30.4	520
396	240	30.2	240	396	519	30.5	520

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
397	240	30.3	240	397	519	30.4	520
398	240	30.7	240	398	519	30.3	520
399	240	30.2	240	399	519	30.3	520
400	240	30.7	240	400	519	30.3	520
401	240	30.2	240	401	519	30.4	520
402	240	30.2	240	402	519	30.3	520
403	240	30.2	240	403	519	30.3	520
404	240	30.2	240	404	519	30.2	520
405	240	30.4	240	405	519	30.3	520
406	240	29.9	240	406	519	30.3	520
407	240	30.3	240	407	519	30.3	520
408	240	30.3	240	408	519	30.1	520
409	240	30.3	240	409	519	30.3	520
410	240	30.4	240	410	519	30.2	520
411	240	30.5	240	411	519	30.3	519
412	240	30.5	240	412	519	30.2	519
413	240	30.7	240	413	519	30.5	519
414	240	30.7	240	414	519	30.3	519
415	240	30.5	240	415	519	30.3	519
416	240	30.1	239	416	519	30.4	519
417	240	30.2	239	417	519	30.6	519
418	240	30.4	239	418	519	30.4	519
419	240	30.5	239	419	519	30.5	519
420	240	30.7	239	420	519	30.3	519
421	240	30.5	239	421	519	30.0	519
422	240	30.5	239	422	519	30.1	519
423	240	30.7	239	423	519	30.1	519
424	240	30.7	239	424	519	30.4	519
425	240	30.6	239	425	519	30.1	519
426	240	30.4	239	426	519	30.2	519
427	240	30.5	239	427	519	30.3	519
428	240	30.5	239	428	519	30.2	519
429	240	30.7	239	429	519	30.3	519
430	240	30.0	239	430	519	30.5	519
431	240	30.1	239	431	519	30.3	518
432	240	30.6	239	432	519	30.5	518
433	240	30.1	239	433	519	30.4	518
434	240	30.2	239	434	519	30.4	518

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.39 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
435	240	30.5	239	435	519	30.3	518
436	240	30.4	239	436	519	30.3	518
437	240	30.2	239	437	519	30.4	518
438	240	30.2	239	438	519	30.4	518
439	240	30.3	239	439	519	30.4	518
440	240	30.4	239	440	519	30.5	518
				441	519	30.5	518
				442	519	30.5	518
				443	519	30.6	518
				444	519	30.4	518
				445	519	30.4	518
				446	519	30.4	518
				447	518	30.3	518
				448	518	30.3	518
				449	518	30.2	518
				450	518	30.2	517
				451	518	30.4	517
				452	518	30.5	517
				453	518	30.1	517
				454	518	30.4	517
				455	518	30.7	517
				456	518	30.5	517
				457	518	30.4	517
				458	518	30.1	517
				459	518	30.1	517
				460	518	30.1	517
				461	518	30.1	517
				462	518	30.1	517
				463	518	30.1	517
				464	518	30.1	517
				465	518	30.2	517
				466	518	30.2	517
				467	518	30.3	517
				468	518	30.5	517
				469	518	30.5	517
				470	518	30.5	516
				471	518	30.4	516
				472	518	30.5	516

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
473	518	30.5	516
474	518	30.1	516
475	518	30.1	516
476	518	30.3	516
477	518	30.1	516
478	518	30.2	516
479	518	30.6	516
480	518	30.4	516
481	518	30.0	516
482	518	30.3	516
483	518	30.3	516
484	518	30.1	516
485	518	30.2	516
486	518	30.6	516
487	518	30.3	516
488	518	30.1	516
489	518	30.1	516
490	518	30.4	515
491	518	30.3	515
492	518	30.3	515
493	518	30.4	515
494	518	30.5	515
495	518	30.4	515
496	518	30.3	515
497	518	30.3	515
498	518	30.3	515
499	518	30.4	515
500	518	30.4	515
501	518	30.2	515
502	518	30.4	515
503	518	30.5	515
504	518	30.1	515
505	518	30.4	515
506	518	30.7	515
507	518	30.5	515
508	518	30.4	515
509	518	30.1	515
510	518	30.1	514

$P_i = 300 \text{ psi}, T = 30.46 \pm 0.26 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
511	518	30.1	514
512	518	30.1	514
513	518	30.1	514
514	518	30.2	514
515	518	30.2	514
516	518	30.3	514
517	518	30.5	514
518	518	30.4	514
519	518	30.3	514
520	518	30.4	514
521	518	30.4	514
522	518	30.4	514
523	518	30.3	514
524	518	30.2	514
525	518	30.2	514

Table A.1B Raw data of Lan Krabue crude API 14.1 tested at $P_i = 300 \text{ psi}$, $T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$ and 700 psi at $T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
0	300	40.0	287	0	700	40.2	686
1	289	40.1	286	1	677	40.5	680
2	285	40.1	285	2	672	40.1	675
3	284	40.4	283	3	667	40.6	670
4	283	40.1	282	4	663	40.2	666
5	280	40.1	281	5	660	40.1	661
6	277	40.2	280	6	656	40.4	657
7	276	40.1	279	7	653	40.1	653
8	276	40.5	278	8	648	39.9	650
9	276	40.3	277	9	645	40.5	646
10	274	40.4	276	10	641	40.4	643
11	271	40.4	275	11	638	40.7	640
12	271	40.4	274	12	635	40.6	637
13	269	40.2	273	13	631	40.7	635
14	269	40.2	272	14	629	40.8	632

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
15	269	40.5	271	15	627	40.8	630
16	267	41.0	270	16	624	40.6	628
17	267	40.0	269	17	620	40.3	625
18	267	40.1	269	18	620	40.7	623
19	267	40.3	268	19	619	40.5	622
20	267	40.0	267	20	617	40.3	620
21	264	40.2	266	21	615	40.6	618
22	264	40.3	266	22	613	40.2	617
23	264	40.0	265	23	613	40.5	615
24	264	40.0	264	24	610	40.1	614
25	264	40.2	264	25	610	40.4	612
26	264	40.3	263	26	608	40.1	611
27	264	40.1	262	27	607	40.2	610
28	262	40.7	262	28	607	40.3	609
29	262	40.4	261	29	606	40.6	608
30	262	40.0	261	30	606	40.2	607
31	262	40.1	260	31	605	40.5	606
32	262	40.1	259	32	604	40.3	605
33	260	40.7	259	33	603	40.3	604
34	260	40.0	258	34	602	40.3	603
35	258	40.3	258	35	601	40.3	603
36	258	40.6	257	36	601	40.4	602
37	256	40.4	257	37	600	40.1	601
38	256	40.4	256	38	600	40.1	601
39	255	40.1	256	39	599	40.4	600
40	255	41.0	256	40	599	40.2	599
41	255	40.6	255	41	599	40.0	599
42	255	40.2	255	42	599	40.3	598
43	255	40.1	254	43	599	40.5	598
44	253	40.3	254	44	599	40.6	597
45	253	40.1	254	45	599	40.1	597
46	253	40.1	253	46	598	40.0	597
47	253	40.2	253	47	598	40.4	596
48	253	40.2	253	48	597	40.3	596
49	252	40.0	252	49	597	40.3	596
50	252	40.4	252	50	597	40.2	595
51	252	40.7	252	51	596	40.6	595
52	252	40.5	251	52	596	40.5	595

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
53	251	40.1	251	53	596	40.0	594
54	251	40.1	251	54	595	40.3	594
55	251	40.0	250	55	595	40.2	594
56	251	40.3	250	56	595	40.0	594
57	251	39.7	250	57	595	40.0	593
58	249	40.4	250	58	594	40.1	593
59	249	40.3	249	59	594	40.2	593
60	249	40.4	249	60	593	40.4	593
61	249	40.1	249	61	593	40.4	593
62	249	40.7	249	62	593	40.3	592
63	249	40.4	248	63	593	40.4	592
64	249	40.0	248	64	593	40.3	592
65	249	40.5	248	65	592	40.2	592
66	248	40.4	248	66	592	40.0	592
67	247	40.0	247	67	592	40.3	592
68	247	40.6	247	68	592	40.4	592
69	247	40.3	247	69	592	40.7	591
70	247	40.7	247	70	591	40.3	591
71	247	40.2	247	71	591	40.3	591
72	247	39.9	246	72	591	40.1	591
73	247	40.2	246	73	591	40.2	591
74	246	40.3	246	74	591	40.4	591
75	246	40.2	246	75	591	40.1	591
76	246	40.4	246	76	591	40.2	591
77	246	40.2	246	77	591	40.1	591
78	246	40.0	245	78	591	40.3	590
79	246	40.2	245	79	591	40.0	590
80	245	39.8	245	80	591	40.2	590
81	245	40.4	245	81	591	39.8	590
82	245	40.5	245	82	591	39.8	590
83	245	40.4	245	83	591	40.2	590
84	245	40.3	245	84	591	40.4	590
85	245	40.6	244	85	591	40.3	590
86	245	40.5	244	86	591	40.1	590
87	245	40.3	244	87	591	40.2	590
88	245	40.3	244	88	591	40.0	590
89	245	40.2	244	89	591	40.2	590
90	245	40.8	244	90	591	40.2	590

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
90	245	40.8	244	90	591	40.2	590
91	245	40.2	244	91	591	40.8	590
92	244	39.5	244	92	591	40.2	590
93	244	40.3	243	93	591	40.3	589
94	244	39.8	243	94	591	40.0	589
95	244	39.6	243	95	591	40.5	589
96	244	40.4	243	96	591	40.2	589
97	244	40.5	243	97	589	39.1	589
98	244	40.5	243	98	589	39.1	589
99	243	40.7	243	99	588	39.9	589
100	243	40.3	243	100	588	40.1	589
101	243	40.2	243	101	588	40.2	589
102	243	39.8	242	102	588	40.0	589
103	243	40.2	242	103	588	40.3	589
104	243	40.6	242	104	588	40.5	589
105	243	41.0	242	105	588	40.0	589
106	242	40.9	242	106	588	40.1	589
107	242	40.5	242	107	588	39.5	589
108	242	40.4	242	108	588	40.2	589
109	242	40.2	242	109	588	40.2	589
110	242	40.1	242	110	588	39.4	589
111	242	40.5	242	111	588	40.2	589
112	241	40.6	242	112	588	40.1	589
113	241	40.0	241	113	588	40.0	589
114	241	40.4	241	114	588	39.8	589
115	241	40.5	241	115	588	40.8	588
116	241	40.7	241	116	588	40.1	588
117	241	40.6	241	117	588	40.1	588
118	241	39.0	241	118	588	40.1	588
119	241	40.6	241	119	588	40.0	588
120	241	40.4	241	120	588	40.2	588
121	241	40.3	241	121	588	40.6	588
122	241	39.9	241	122	588	40.5	588
123	241	40.1	241	123	588	41.0	588
124	240	40.2	241	124	588	40.5	588
125	240	39.5	241	125	588	40.0	588
126	240	40.3	241	126	588	40.2	588
127	240	40.3	240	127	588	38.5	588

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
127	240	40.3	240	127	588	38.5	588
128	240	40.1	240	128	588	39.6	588
129	240	39.4	240	129	588	40.0	588
130	240	39.7	240	130	588	40.6	588
131	240	40.3	240	131	588	40.2	588
132	240	40.2	240	132	588	40.5	588
133	240	39.8	240	133	588	40.1	588
134	240	40.1	240	134	588	40.1	588
135	240	40.0	240	135	588	40.2	588
136	240	40.5	240	136	588	40.4	588
137	240	40.4	240	137	588	40.3	588
138	240	40.0	240	138	588	38.7	588
139	240	40.1	240	139	588	39.3	588
140	240	40.3	240	140	588	40.5	588
141	240	40.6	240	141	588	40.7	588
142	240	40.7	240	142	587	40.5	588
143	240	40.3	240	143	587	40.4	588
144	240	40.6	239	144	587	40.4	587
145	240	40.4	239	145	587	40.4	587
146	239	40.3	239	146	587	39.5	587
147	239	40.4	239	147	587	39.8	587
148	239	40.1	239	148	587	40.2	587
149	239	40.1	239	149	587	40.3	587
150	239	40.3	239	150	587	40.2	587
151	239	40.2	239	151	587	39.4	587
152	239	40.2	239	152	587	39.1	587
153	239	40.6	239	153	587	40.5	587
154	239	40.5	239	154	587	40.8	587
155	239	40.7	239	155	587	41.6	587
156	238	40.6	239	156	587	40.6	587
157	238	40.1	239	157	587	40.2	587
158	238	40.1	239	158	587	40.1	587
159	238	40.8	239	159	587	40.4	587
160	238	40.4	239	160	587	40.3	587
161	238	40.3	239	161	587	39.5	587
162	238	40.6	239	162	587	39.9	587
163	238	40.2	239	163	587	40.1	587
164	238	40.3	238	164	587	40.8	587

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
165	238	40.1	238	165	587	40.0	587
166	238	40.2	238	166	587	40.1	587
167	238	40.2	238	167	587	40.2	587
168	238	40.0	238	168	587	40.6	587
169	238	40.3	238	169	586	40.5	587
170	238	40.6	238	170	586	40.4	587
171	238	40.3	238	171	586	40.5	587
172	238	40.1	238	172	586	40.3	587
173	238	40.0	238	173	586	40.3	587
174	238	40.3	238	174	586	40.2	586
175	238	40.2	238	175	586	40.3	586
176	238	40.0	238	176	586	40.4	586
177	237	39.8	238	177	586	40.6	586
178	237	40.6	238	178	586	40.0	586
179	237	40.1	238	179	586	40.2	586
180	237	40.5	238	180	586	40.3	586
181	237	40.5	238	181	586	40.5	586
182	237	40.0	238	182	586	40.7	586
183	237	40.7	238	183	585	39.8	586
184	237	40.5	238	184	585	39.5	586
185	237	39.6	238	185	585	40.2	586
186	237	39.3	238	186	585	39.8	586
187	237	40.2	237	187	585	40.3	586
188	237	40.1	237	188	585	40.4	586
189	237	40.5	237	189	585	40.5	586
190	237	40.0	237	190	585	40.1	586
191	237	40.1	237	191	585	40.4	586
192	237	40.1	237	192	585	40.2	586
193	237	40.5	237	193	585	40.4	586
194	237	40.1	237	194	585	40.0	586
195	237	40.3	237	195	585	40.2	586
196	237	40.4	237	196	585	40.4	586
197	237	40.3	237	197	585	40.3	586
198	236	40.2	237	198	585	40.3	586
199	236	40.0	237	199	585	40.2	586
200	236	40.5	237	200	585	40.1	586
201	236	40.0	237	201	585	40.0	586
202	236	40.3	237	202	585	40.0	586

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
203	236	40.2	237	203	585	40.0	586
204	236	40.3	237	204	585	40.1	586
205	236	40.6	237	205	585	40.0	585
206	236	40.3	237	206	585	40.0	585
207	236	39.7	237	207	585	40.7	585
208	236	40.3	237	208	585	40.7	585
209	236	40.8	237	209	585	40.5	585
210	236	40.8	237	210	585	40.7	585
211	236	40.2	237	211	585	40.6	585
212	236	40.7	237	212	585	40.5	585
213	236	40.9	236	213	585	40.2	585
214	236	40.6	236	214	585	40.1	585
215	236	40.5	236	215	585	40.1	585
216	236	40.6	236	216	585	40.3	585
217	236	40.2	236	217	584	40.2	585
218	236	40.1	236	218	584	40.3	585
219	236	40.1	236	219	584	40.0	585
220	236	40.4	236	220	584	40.3	585
221	236	40.2	236	221	584	40.4	585
222	235	40.0	236	222	584	40.2	585
223	235	40.2	236	223	584	40.0	585
224	235	40.2	236	224	584	40.1	585
225	235	40.1	236	225	584	40.3	585
226	235	40.1	236	226	584	40.4	585
227	235	40.3	236	227	584	40.3	585
228	235	40.2	236	228	584	40.2	585
229	235	40.5	236	229	584	40.1	585
230	235	40.6	236	230	584	40.1	585
231	235	40.3	236	231	584	40.2	585
232	235	39.8	236	232	584	40.2	585
233	235	40.8	236	233	584	40.3	585
234	235	40.2	236	234	584	40.0	585
235	235	40.2	236	235	584	40.1	585
236	235	40.1	236	236	584	40.5	585
237	235	40.2	236	237	584	40.5	584
238	235	40.3	236	238	584	40.3	584
239	235	40.0	235	239	584	40.4	584
240	235	40.2	235	240	584	40.4	584

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
241	235	40.3	235	241	584	40.1	584
242	235	40.2	235	242	584	40.2	584
243	235	40.4	235	243	584	40.3	584
244	235	40.2	235	244	584	40.2	584
245	235	40.0	235	245	584	40.2	584
246	235	40.5	235	246	584	40.1	584
247	235	40.3	235	247	584	40.0	584
248	235	40.4	235	248	584	40.4	584
249	235	40.2	235	249	584	40.4	584
250	235	40.1	235	250	584	40.4	584
251	235	40.5	235	251	584	40.4	584
252	235	40.1	235	252	584	40.3	584
253	235	40.2	235	253	584	40.5	584
254	235	40.0	235	254	584	40.5	584
255	235	40.5	235	255	584	40.0	584
256	235	40.4	235	256	584	40.2	584
257	235	40.3	235	257	584	40.1	584
258	235	40.2	235	258	584	40.3	584
259	235	40.0	235	259	584	40.2	584
260	235	40.0	235	260	584	40.5	584
261	235	40.2	235	261	583	40.0	584
262	235	40.1	235	262	583	40.0	584
263	235	40.1	235	263	583	40.1	584
264	235	40.0	235	264	583	40.3	584
265	235	40.0	235	265	583	40.3	584
266	235	40.0	235	266	583	39.9	584
267	235	40.8	234	267	583	40.2	584
268	235	40.5	234	268	583	40.1	583
269	235	40.1	234	269	583	40.0	583
270	235	40.2	234	270	583	40.2	583
271	235	40.0	234	271	583	40.1	583
272	235	40.1	234	272	583	40.4	583
273	235	40.9	234	273	583	40.3	583
274	235	40.2	234	274	583	40.3	583
275	235	40.3	234	275	583	40.1	583
276	235	40.2	234	276	583	40.2	583
277	235	40.4	234	277	583	40.1	583
278	235	40.2	234	278	583	40.3	583

$P_i = 300 \text{ psi}, T = 40.27 \pm 0.28 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
279	235	40.5	234	279	583	40.0	583
280	235	40.6	234	280	583	40.4	583
281	235	40.2	234	281	583	40.1	583
282	235	40.8	234	282	583	40.0	583
283	235	40.2	234	283	583	40.2	583
284	235	40.2	234	284	583	40.4	583
285	235	40.1	234	285	583	40.5	583
286	235	40.2	234	286	583	40.3	583
287	235	40.3	234	287	583	40.3	583
288	235	40.4	234	288	583	40.0	583
289	235	40.2	234	289	583	40.1	583
290	235	40.0	234	290	583	40.1	583
				291	583	40.0	583
				292	583	40.4	583
				293	583	40.4	583
				294	583	40.4	583
				295	583	40.2	583
				296	583	40.1	583
				297	583	40.3	583
				298	583	40.2	583
				299	583	40.1	582
				300	583	40.1	582
				301	583	40.2	582
				302	583	40.1	582
				303	583	40.3	582
				304	583	40.0	582
				305	583	40.4	582
				306	583	40.1	582
				307	583	40.3	582
				308	583	40.2	582
				309	583	40.3	582
				310	583	40.2	582
				311	583	40.4	582
				312	583	40.3	582
				313	583	40.2	582
				314	583	40.5	582
				315	583	40.3	582
				316	583	40.4	582

$P_i = 700 \text{ psi}, T = 40.22 \pm 0.30 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
317	583	40.2	582
318	583	40.4	582
321	583	40.4	582
322	583	40.3	582
323	583	40.2	582
324	583	40.3	582
325	583	40.0	582
326	583	40.3	582
327	583	40.4	582
328	583	40.2	582
329	583	40.3	582

A.2 Raw Measured and Fitted Data for Lan Krabue Crude API = 21.3

- Calculation of pressure of fitted curve

By equation 4.1 gathered from MATLAB

$$f(x) = a \times \exp(b \times x) + c \times \exp(d \times x) \quad (4.1)$$

$$k_1 = \frac{-1}{b} \quad (4.2)$$

$$k_2 = \frac{-1}{d} \quad (4.3)$$

$$P(t) = m_1 \exp\left(-\frac{t}{k_1}\right) + m_2 \exp\left(-\frac{t}{k_2}\right) + P_{eq} \quad (2.10)$$

Table A.2A Raw data of Lan Krabue crude API 21.3 tested at $P_i = 300$ psi, $T = 30.40 \pm 0.24$ °C and $P_i = 700$ psi, $T = 30.42 \pm 0.19$ °C

$P_i = 300$ psi, $T = 30.40 \pm 0.24$ °C				$P_i = 700$ psi, $T = 30.42 \pm 0.19$ °C			
Time (hr)	Pressure (psi)	Temp (°C)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp (°C)	P fitted (psi)
0	300	29.9	297	0	700	30.0	689
1	289	29.6	291	1	676	30.1	677
2	286	30.3	285	2	663	30.2	666
3	280	30.5	280	3	653	30.6	656
4	275	30.3	276	4	642	30.5	647
5	272	30.0	272	5	637	30.9	639
6	268	30.9	268	6	628	30.0	632
7	263	30.9	264	7	624	30.5	626
8	260	30.5	261	8	618	30.3	620
9	257	30.3	258	9	614	30.0	615
10	254	30.8	256	10	611	30.5	610
11	252	30.2	253	11	608	30.8	606
12	250	30.7	251	12	602	30.0	602
13	248	30.5	249	13	599	30.5	599
14	247	30.7	247	14	597	30.1	596
15	245	30.3	245	15	596	30.7	593
16	244	30.7	244	16	593	30.5	591
17	242	30.3	242	17	590	30.3	589
18	242	30.6	241	18	589	30.2	587
19	241	30.7	240	19	587	30.3	585

$P_i = 300 \text{ psi}, T = 30.40 \pm 0.24 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.42 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
20	239	30.1	239	20	585	30.3	583
21	239	30.5	238	21	583	30.0	582
22	237	30.7	237	22	581	30.0	581
23	237	30.2	236	23	579	30.3	579
24	235	29.8	235	24	579	30.4	578
25	235	30.1	234	25	578	30.4	577
26	234	30.4	234	26	577	30.5	577
27	233	30.2	233	27	577	30.3	576
28	233	30.2	233	28	576	30.0	575
29	233	30.6	232	29	576	30.5	574
30	232	30.5	232	30	574	29.9	574
31	231	30.5	231	31	574	30.5	573
32	231	30.5	231	32	574	30.4	573
33	231	30.7	230	33	573	30.3	572
34	230	30.0	230	34	573	30.3	572
35	230	30.2	230	35	573	30.4	572
36	230	30.9	229	36	573	30.6	571
37	229	30.6	229	37	572	30.5	571
38	229	30.5	229	38	571	30.3	571
39	229	30.4	229	39	571	30.5	571
40	229	30.7	228	40	571	30.6	570
41	228	30.1	228	41	571	30.6	570
42	228	30.5	228	42	571	30.5	570
43	228	30.2	228	43	571	30.3	570
44	228	30.5	228	44	570	30.1	570
45	228	30.4	228	45	570	30.3	570
46	228	30.4	227	46	569	30.3	569
47	228	30.5	227	47	569	30.2	569
48	228	30.3	227	48	569	30.5	569
49	227	30.2	227	49	569	30.3	569
50	227	30.6	227	50	569	30.2	569
51	227	30.4	227	51	569	30.5	569
52	227	30.4	227	52	569	30.5	569
53	227	30.8	227	53	569	30.3	569
54	226	30.5	227	54	569	30.4	569
55	226	30.8	227	55	569	30.6	569
56	226	30.4	226	56	569	30.7	569
57	226	30.7	226	57	569	30.6	569

$P_i = 300 \text{ psi}, T = 30.40 \pm 0.24 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.42 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
58	226	30.7	226	58	569	30.6	568
59	226	30.7	226	59	568	30.4	568
60	226	30.7	226	60	568	30.3	568
61	226	30.7	226	61	568	30.5	568
62	226	30.6	226	62	568	30.5	568
63	226	30.5	226	63	568	30.5	568
64	226	30.5	226	64	568	30.5	568
65	226	30.5	226	65	568	30.5	568
66	226	30.8	226	66	568	30.4	568
67	226	30.6	226	67	567	30.3	568
68	226	30.4	226	68	567	30.4	568
69	226	30.2	226	69	567	30.5	568
70	226	30.2	226	70	567	30.2	568
71	226	29.9	226	71	567	30.0	568
72	226	30.8	226	72	567	30.2	568
73	226	30.7	225	73	567	30.3	568
74	226	30.9	225	74	567	30.3	568
75	225	30.4	225	75	567	30.3	568
76	225	30.5	225	76	567	30.3	568
77	225	30.6	225	77	567	30.3	568
78	225	30.1	225	78	567	30.2	568
79	225	30.6	225	79	567	30.3	567
80	225	30.5	225	80	567	30.4	567
81	225	30.6	225	81	567	30.5	567
82	225	30.2	225	82	567	30.3	567
83	225	30.0	225	83	567	30.4	567
84	225	30.1	225	84	567	29.9	567
85	225	30.1	225	85	567	30.3	567
86	225	30.2	225	86	567	30.6	567
87	225	30.4	225	87	567	30.6	567
88	225	30.4	225	88	567	30.5	567
89	225	30.4	225	89	567	30.6	567
90	225	30.1	225	90	567	30.4	567
91	225	30.3	225	91	567	30.7	567
92	225	30.6	225	92	567	30.7	567
93	225	30.5	225	93	567	30.7	567
94	225	30.3	225	94	567	30.4	567
95	225	30.5	225	95	566	30.2	567

$P_i = 300 \text{ psi}, T = 30.40 \pm 0.24 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.42 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
96	224	30.3	225	96	566	30.2	567
97	224	30.8	224	97	566	30.4	567
98	224	30.0	224	98	566	30.2	567
99	224	30.5	224	99	566	30.4	567
100	224	30.5	224	100	566	30.3	567
101	223	30.7	224	101	566	30.3	567
102	223	30.2	224	102	566	30.3	567
103	223	30.1	224	103	566	30.4	567
104	223	30.5	224	104	566	30.5	567
105	223	30.6	224	105	566	30.5	566
106	223	30.8	224	106	566	30.5	566
107	223	30.4	224	107	566	30.1	566
108	223	30.3	224	108	566	30.5	566
109	223	30.4	224	109	566	30.5	566
110	223	30.4	224	110	566	30.5	566
111	223	30.7	224	111	566	30.4	566
112	223	30.2	224	112	566	30.3	566
113	223	30.2	224	113	566	30.5	566
114	223	30.1	224	114	565	30.3	566
115	223	30.4	224	115	565	30.5	566
116	223	30.3	224	116	565	30.4	566
117	223	30.3	224	117	565	30.4	566
118	223	30.3	224	118	565	30.4	566
119	223	30.3	224	119	565	30.3	566
120	223	30.5	224	120	565	30.5	566
121	223	30.5	224	121	565	30.6	566
122	223	30.6	224	122	565	30.7	566
123	223	30.7	224	123	565	30.6	566
124	223	30.3	223	124	565	30.8	566
125	223	30.0	223	125	565	30.6	566
126	223	30.6	223	126	565	30.6	566
127	223	30.6	223	127	565	30.5	566
128	223	30.6	223	128	565	30.6	566
129	223	30.4	223	129	565	30.3	566
130	223	30.6	223	130	565	30.4	566
131	223	30.3	223	131	565	30.4	566
132	223	30.3	223	132	565	30.8	565
133	223	30.4	223	133	565	30.6	565

$P_i = 300 \text{ psi}, T = 30.40 \pm 0.24 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 30.42 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
134	223	30.5	223	134	565	30.4	565
135	223	30.4	223	135	565	30.4	565
136	223	30.3	223	136	565	30.5	565
137	223	30.1	223	137	565	30.5	565
138	223	30.4	223	138	565	30.1	565
139	223	30.5	223	139	565	30.5	565
140	223	30.4	223	140	565	30.4	565
141	223	30.3	223	141	565	30.3	565
142	223	30.3	223	142	565	30.0	565
143	223	30.2	223	143	565	30.4	565
144	223	30.2	223	144	565	30.5	565
145	223	30.4	223	145	565	30.6	565
146	223	29.7	223	146	565	30.3	565
147	223	29.8	223	147	565	30.5	565
148	223	30.0	223	148	565	30.4	565
149	223	30.1	223	149	565	30.4	565
150	223	30.4	223	150	565	30.6	565
151	223	30.3	223	151	565	30.5	565
152	223	30.3	222	152	565	30.4	565
153	223	30.3	222	153	565	30.6	565
154	223	30.4	222	154	565	30.6	565
155	223	30.2	222	155	565	30.6	565
156	223	30.5	222	156	565	30.5	565
157	223	30.5	222	157	565	30.7	565
158	223	30.4	222	158	565	30.7	565
159	223	30.3	222	159	565	30.7	564
160	223	30.3	222	160	565	30.7	564
161	223	30.4	222	161	565	30.6	564
162	223	30.2	222	162	565	30.7	564
163	223	30.1	222	163	565	30.7	564
164	223	30.3	222	164	565	30.7	564
165	223	30.3	222	165	565	30.7	564
				166	565	30.6	564
				167	565	30.5	564
				168	565	30.6	564
				169	565	30.5	564
				170	565	30.5	564
				171	565	30.4	564

$P_i = 700 \text{ psi}, T = 30.42 \pm 0.19 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
172	565	30.6	564
173	565	30.5	564
174	565	30.5	564
175	565	30.4	564
176	565	30.6	564
177	565	30.4	564
178	565	30.3	564
179	565	30.2	564

Table A.2B Raw data of Lan Krabue crude API 21.3 tested at $P_i = 300 \text{ psi}$, $T = 40.26 \pm 0.27 \text{ }^\circ\text{C}$ and $P_i = 700 \text{ psi}$, $T = 40.20 \pm 0.34 \text{ }^\circ\text{C}$

$P_i = 300 \text{ psi}, T = 40.26 \pm 0.27 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.20 \pm 0.34 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
0	300	39.9	297	0	700	40.0	706
1	286	40.0	288	1	689	40.5	688
2	278	40.4	281	2	673	39.9	672
3	272	40.1	274	3	663	39.3	660
4	269	40.1	269	4	651	38.7	649
5	265	40.2	264	5	648	40.1	640
6	260	40.3	259	6	637	40.5	633
7	256	40.2	256	7	626	39.9	627
8	253	40.3	252	8	618	41.1	622
9	250	40.2	249	9	615	39.7	617
10	247	40.1	247	10	613	40.7	614
11	245	40.0	245	11	610	40.0	611
12	243	40.2	243	12	606	39.8	608
13	240	40.0	241	13	603	40.8	606
14	240	40.8	239	14	600	40.2	604
15	239	40.9	238	15	600	40.0	603
16	236	39.1	237	16	600	40.3	602
17	234	40.1	236	17	599	40.6	601
18	234	40.3	235	18	598	40.4	600
19	233	40.0	234	19	598	40.7	599
20	233	40.1	234	20	598	40.8	598
21	233	40.5	233	21	598	40.7	598

$P_i = 300 \text{ psi}, T = 40.26 \pm 0.27 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.20 \pm 0.34 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
22	233	40.3	232	22	597	40.4	597
23	232	40.2	232	23	597	40.4	597
24	232	40.4	232	24	597	40.3	597
25	232	40.5	231	25	597	40.7	597
26	232	40.3	231	26	597	39.0	596
27	231	40.1	231	27	597	40.4	596
28	231	40.0	230	28	597	40.0	596
29	230	40.0	230	29	597	40.2	596
30	230	40.5	230	30	597	40.4	596
31	230	40.0	230	31	596	40.1	596
32	230	40.2	230	32	596	39.9	596
33	230	40.2	230	33	596	40.2	596
34	230	40.1	229	34	596	40.2	595
35	230	40.2	229	35	596	40.2	595
36	230	40.1	229	36	596	40.3	595
37	230	40.4	229	37	596	40.7	595
38	229	40.2	229	38	596	40.3	595
39	229	40.2	229	39	596	40.5	595
40	229	40.1	229	40	596	40.2	595
41	229	40.4	229	41	596	40.0	595
42	229	40.0	229	42	596	40.1	595
43	229	40.2	229	43	596	40.6	595
44	229	40.3	229	44	596	40.7	595
45	229	40.1	229	45	596	40.3	595
46	229	40.2	229	46	596	40.3	595
47	229	40.2	229	47	596	40.3	595
48	229	40.0	229	48	596	40.2	595
49	229	40.1	229	49	596	40.2	595
50	229	40.6	229	50	596	40.1	595
51	229	40.7	229	51	596	40.4	595
52	229	40.7	229	52	596	40.3	595
53	229	40.4	229	53	596	40.1	595
54	228	40.3	229	54	596	39.9	595
55	228	40.4	229	55	595	40.2	595
56	228	40.4	229	56	595	40.1	595
57	228	40.6	229	57	595	40.0	595
58	228	40.5	229	58	595	40.0	595
59	228	40.7	228	59	595	40.5	595

$P_i = 300 \text{ psi}, T = 40.26 \pm 0.27 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.20 \pm 0.34 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
60	228	40.0	228	60	595	40.2	595
61	228	40.8	228	61	595	40.1	595
62	228	40.6	228	62	595	39.8	595
63	228	40.4	228	63	595	39.6	595
64	228	40.4	228	64	595	40.2	595
65	228	40.5	228	65	595	39.7	595
66	228	40.3	228	66	595	40.2	595
67	228	40.2	228	67	595	40.2	595
68	228	40.4	228	68	595	40.5	595
69	228	40.5	228	69	595	40.1	595
70	228	40.3	228	70	595	39.7	595
71	228	40.1	228	71	595	39.9	595
72	228	40.0	228	72	595	40.2	595
73	228	40.0	228	73	595	40.5	595
74	228	40.5	228	74	595	40.2	595
75	228	40.0	228	75	595	40.0	595
76	228	40.2	228	76	595	40.1	595
77	228	40.2	228	77	595	40.6	595
78	228	40.1	228	78	595	40.7	595
79	228	40.2	228	79	595	40.3	595
80	228	40.1	228	80	595	40.3	595
81	228	40.4	228	81	595	40.3	595
82	228	40.2	228	82	595	40.2	595
83	228	40.2	228	83	595	40.2	595
84	228	40.1	228	84	595	40.1	595
85	228	40.4	228	85	595	40.4	595
86	228	40.0	228	86	595	40.3	595
87	228	40.2	228	87	595	40.1	595
88	228	40.1	228	88	595	39.9	595
89	228	39.1	228	89	595	40.2	595
90	228	40.1	228	90	595	40.1	595
91	228	40.3	228	91	595	40.0	595
92	228	40.0	228	92	595	40.0	595
93	228	40.1	228	93	595	40.5	595
94	228	40.5	228	94	595	40.2	595
95	228	40.3	228	95	595	40.1	595
96	228	40.5	228	96	595	39.8	595
97	228	40.0	228	97	595	40.7	595

$P_i = 300 \text{ psi}, T = 40.26 \pm 0.27 \text{ }^\circ\text{C}$				$P_i = 700 \text{ psi}, T = 40.20 \pm 0.34 \text{ }^\circ\text{C}$			
Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)	Time (hr)	Pressure (psi)	Temp ($^\circ\text{C}$)	P fitted (psi)
98	228	40.2	228	98	595	40.0	595
99	228	40.2	228	99	595	39.8	595
100	228	40.0	228	100	595	40.8	595
101	228	40.1	228	101	595	40.2	595
102	228	40.6	228	102	595	40.0	595
103	228	40.7	228	103	595	40.3	595
104	228	40.2	228	104	595	40.6	595
105	228	40.4	228	105	595	40.4	595
106	228	40.7	228	106	595	40.7	595
107	228	40.6	228	107	595	40.1	595
108	228	40.5	228	108	595	40.0	595
109	228	40.7	228	109	595	40.0	595
110	228	40.0	228	110	595	40.5	595
111	228	40.3	228	111	595	40.0	595
112	228	40.5	228	112	595	40.0	595
113	228	40.0	228	113	595	40.5	595
114	228	40.2	228	114	595	40.2	595
115	228	40.2	228	115	595	40.1	595
116	228	40.1	228	116	595	40.0	595
117	228	40.8	228	117	595	40.0	595
118	228	40.6	228	118	595	40.5	595
119	228	40.4	228	119	595	40.2	595
120	228	40.7	228	120	595	40.1	595
				121	595	39.8	595
				122	595	40.7	595
				123	595	40.0	595
				124	595	39.8	595
				125	595	40.8	595
				126	595	40.2	595
				127	595	40.0	595
				128	595	40.5	595
				129	595	40.1	595
				130	595	39.7	595
				131	595	39.9	595

A.3 Calculation of Diffusion Coefficient

$$k_1 = \frac{-1}{b} \quad (4.2)$$

$$D_{AB} = \frac{4z_0^2}{k_1\pi^2} \quad (2.11)$$

where

D_{AB} is diffusion coefficient, m^2/s

Z_0 is height of crude oil in Parr reactor, constant 0.031 m

k_1 is calculate from equation 4.2, s

- π is constant 3.14

- Example: Experiment 1: Lan Krabue crude API 14.1, $P_i = 300$ psi, $T = 30.46 \pm 0.26$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 36.5 s. for 440 hr.

From MATLAB get the value of a, b, c, d as show in the table below.

a	33.64
b	-0.0118
c	252
d	-0.0001248

Z_0 (m)	$Z_0^2(m^2)$	π	π^2
0.031	0.000961	3.14	9.8596

$$\begin{aligned} k_1 &= \frac{-1}{-0.01899} \\ &= 52.65929 \text{ hr.} \\ &= 52.65929 \times 60 \times 60 \\ &= 189573 \text{ s} \end{aligned}$$

$$\begin{aligned} D_{AB} &= \frac{4 \times 0.000961}{189573 \times 9.8596} \\ &= 2.057 \times 10^{-9} \text{ m}^2/\text{s} \end{aligned}$$

A.3.1 The value of a, b, c, and d gathered from MATLAB of each experiment

- Experiment 1: $P_i = 300$ psi, $T = 30.46 \pm 0.26$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 36.5 s. for 440 hr.

Table A.3A Raw data from MATLAB of Lan Krabue crude API 14.1, $P_i = 300$ psi, $T = 30.46 \pm 0.26$ °C

a	33.64
b	-0.0118
c	252
d	-0.0001248

- Experiment 2: $P_i = 700$ psi, $T = 30.39 \pm 0.19$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 38.2 s. for 525 hr.

Table A.3B Raw data from MATLAB of Lan Krabue crude API 14.1, $P_i = 700$ psi, $T = 30.39 \pm 0.19$ °C

a	134.3
b	-0.03118
c	540.8
d	-0.00009791

- Experiment 3: $P_i = 300$ psi, $T = 40.27 \pm 0.28$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 38.3 s. for 290 hr.

Table A.3C Raw data from MATLAB of Lan Krabue crude API 14.1, $P_i = 300$ psi, $T = 40.27 \pm 0.28$ °C

a	42.92
b	-0.03004
c	244.2
d	-0.00015

- Experiment 4: $P_i = 700$ psi, $T = 40.22 \pm 0.30$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 38.9 s. for 329 hr.

Table A.3D Raw data from MATLAB of Lan Krabue crude API 14.1, $P_i = 700$ psi, $T = 40.22 \pm 0.30$ °C

a	93.44
b	-0.05965
c	592.1
d	-0.00005473

- Experiment 5: $P_i = 300$ psi, $T = 30.40 \pm 0.24$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 38.4 s. for 165 hr.

Table A.3E Raw data from MATLAB of Lan Krabue crude API 21.3, $P_i = 300$ psi, $T = 30.40 \pm 0.24$ °C

a	68.66
b	-0.09045
c	228.1
d	-0.00016

- Experiment 6: $P_i = 700$ psi, $T = 30.42 \pm 0.19$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 39.2 s. for 179 hr.

Table A.3F Raw data from MATLAB of Lan Krabue crude API 21.3, $P_i = 700$ psi, $T = 30.42 \pm 0.19$ °C

a	118.7
b	-0.1083
c	570.4
d	-0.00006568

- Experiment 7: $P_i = 300$ psi, $T = 40.26 \pm 0.27$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 38.9 s. for 120 hr.

Table A.3G Raw data from MATLAB of Lan Krabue crude API 21.3, $P_i = 300$ psi, $T = 40.26 \pm 0.27$ °C

a	67.32
b	-0.1335
c	229.2
d	-0.00005391

- Experiment 8: $P_i = 700$ psi, $T = 40.20 \pm 0.34$ °C, $Z_0 = 3.1$ cm, and CO_2 feed time = 38.6 s. for 131 hr.

Table A.3H Raw data from MATLAB of Lan Krabue crude API 21.3, $P_i = 700$ psi, $T = 40.20 \pm 0.34$ °C

a	110.2
b	-0.1783
c	595.3
d	-0.00000353

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Proceeding

1. Janthothai, J.; Saiwan, C.; and Torabi, F. (2014, April 22) Experimental measurement of diffusivity of carbon dioxide in Lan Krabue crude. Proceedings of the 5th Research Symposium on Petrochemical and Materials Technology and The 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

Presentations:

1. Janthothai, J.; Saiwan, C.; and Torabi, F. (2014, April 22) Experimental measurement of diffusivity of carbon dioxide in Lan Krabue crude. Paper presented The 5th Research Symposium on Petrochemical and Materials Technology and The 20th PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.
2. Janthothai, J.; Saiwan, C.; and Torabi, F. (2014, May 7-8) Experimental measurement of diffusivity of CO₂ in Lan Krabue crude. Paper presented International conference on Environment and Renewable Energy, Paris, France