

Dilatometric Analysis of Fe 4.08 Ni 0.39 C 2.05 Si

7-8-81

Specimen #1

Isothermal transformation temp = 350°C

Mass = 1369

Spec. Length = 22.75 mm

Time/s
(t-t₀)

$\Delta L/L$

1	44	9.632×10^{-5}
2	116	2.889×10^{-4}
3	189	6.743×10^{-4}
4	262	1.381×10^{-3}
5	332	2.058×10^{-3}
6	404	2.562×10^{-3}
7	472	2.89×10^{-3}
8	548	3.105×10^{-3}
9	620	3.243×10^{-3}
10	692	3.346×10^{-3}
11	764	3.429×10^{-3}
12	836	3.474×10^{-3}
13	908	3.532×10^{-3}
14	980	3.564×10^{-3}
15	1124	3.615×10^{-3}
16	1412	3.6924×10^{-3}
17	1988	3.7414×10^{-3}

$t =$ Reaction start time $\approx$ ²⁸ max $\Delta L/L = 3.76 \times 10^{-3}$

Specimen Y2 $\tau \approx 60s$ Isothermally transformed at $443^{\circ}C$ $Mg = 1369$ Spec. length = 22.76 mm

	$(t-\tau)$ Time / s	$\Delta L / L$
1	72	9.31×10^{-5}
2	144	3.76×10^{-4}
3	216	7.42×10^{-4}
4	288	1.092×10^{-3}
5	360	1.464×10^{-3}
6	432	1.734×10^{-3}
7	504	1.959×10^{-3}
8	576	2.119×10^{-3}
9	648	2.248×10^{-3}
10	720	2.344×10^{-3}
11	792	2.415×10^{-3}
12	864	2.475×10^{-3}
13	936	2.533×10^{-3}
14	1080	2.585×10^{-3}
15	1368	2.650×10^{-3}

16 Max $\Delta L / L = 2.70 \times 10^{-3}$

Speimen 73 Isothermal Transfm. Temp = 607°C Mag = 1369 length = 22.75mm.

$$\tau \approx 12.8s$$

(t - τ)
Time / s

$\Delta L / L$

1	4.15	8.99×10^{-5}
2	7.20	2.60×10^{-4}
3	10.2	5.20×10^{-4}
4	13.2	8.38×10^{-4}
5	16.2	1.188×10^{-3}
6	19.2	1.509×10^{-3}
7	22.2	1.737×10^{-3}
8	25.2	1.894×10^{-3}
9	28.2	1.965×10^{-3}
10	34.2	2.016×10^{-3}
11	107.4	2.042×10^{-3}
12	251.2	2.061×10^{-3}
13	539.2	2.064×10^{-3}
14	1115.2	2.064×10^{-3}

∴ Max $\Delta L / L = 2.09 \times 10^{-3}$

(A re-run of this as Y4B also available)

Specimen Y4 Isothermal Transfm. Temp = 530°C Mag = 1369 length = 22.75 mm

$\tau < 15.$

	(t- τ) Time / s	$\Delta L / L$
1	8.8	3.63×10^{-4}
2	9.98	4.43×10^{-4}
3	11.18	5.14×10^{-4}
4	12.38	5.78×10^{-4}
5	13.58	6.36×10^{-4}
6	14.78	6.678×10^{-4}
7	15.98	6.77×10^{-4}
8	17.18	6.81×10^{-4}
9	19.58	6.81×10^{-4}
10	20.78	6.84×10^{-4}
11	21.98	6.90×10^{-4}
12	23.18	7.0×10^{-4}
13	25.6	7.26×10^{-4}
14	28.0	7.71×10^{-4}
15	30.4	8.35×10^{-4}
16	32.8	9.02×10^{-4}
17	35.2	9.70×10^{-4}
18	37.6	1.03×10^{-3}
19	42.4	1.12×10^{-3}
20	54.0	1.18×10^{-3}
21	80.0	1.26×10^{-3}
22	112	1.51×10^{-3}
23	184	1.93×10^{-3}
24	258	2.05×10^{-3}
25	403	2.06×10^{-3}

Max $\Delta L / L = 2.09 \times 10^{-3}$

Specimen Y5 Isothermally transformed at 455°C Length = 22.75 mm Mag = 1369

$$\tau \approx 50s$$

$$\text{Max } \Delta L/L = 2.03 \times 10^{-3}$$

	$(t - \tau)$ Time / s	$\Delta L/L$
1	22.4	5.78×10^{-5}
2	79.0	2.89×10^{-4}
3	151	6.1×10^{-4}
4	223	9.15×10^{-4}
5	295	1.17×10^{-3}
6	367	1.35×10^{-3}
7	439	1.49×10^{-3}
8	511	1.599×10^{-3}
9	655	1.73×10^{-3}
10	943	1.83×10^{-3}
11	1519	1.88×10^{-3}
12	2128	1.89×10^{-3}
13		
14		
15		
16		
17		
18		
19		
20		
21		

Specimen 76 Isothermally transformed at 408°C length = 22.75 mm $M_{\text{eng}} = 1369$

$$\tau \approx 44 \text{ s} \quad \text{Max } \Delta L/L = 2.50 \times 10^{-3}$$

	$(t-\tau)$ Time / s	$\Delta L/L$
1	72	2.216×10^{-4}
2	144	5.75×10^{-4}
3	216	9.34×10^{-4}
4	288	1.284×10^{-3}
5	360	1.57×10^{-3}
6	432	1.79×10^{-3}
7	504	1.95×10^{-3}
8	576	2.07×10^{-3}
9	648	2.18×10^{-3}
10	720	2.25×10^{-3}
11	864	2.35×10^{-3}
12	1152	2.47×10^{-3}
13	1729	2.52×10^{-3}
14	6931	2.52×10^{-3}

Specimen 7/8 Isothermally transformed at 360°C length = 22.75 mm Mass = 1369

$\bar{\epsilon} \approx 265$

$\frac{(\epsilon - \bar{\epsilon})}{\text{Time / s}}$

$\Delta L / L$

1	14	4.82×10^{-5}
2	79.2	5.24×10^{-4}
3	151.4	1.25×10^{-3}
4	223.4	1.86×10^{-3}
5	295.2	2.22×10^{-3}
6	367	2.43×10^{-3}
7	511	2.67×10^{-3}
8	794	2.84×10^{-3}
9	1375	2.93×10^{-3}
10	1951	2.95×10^{-3}
11		
12		
13		
14		
15		
16		
17		
18		

Specimen Y9

Isothermally transformed at 660°C length = 22.85 mm

Mag = 1369

$T = 25^{\circ}\text{C}$

meas $\Delta L/L = 1.83 \times 10^{-3}$

(t - t₀)
Time /s

$\Delta L/L$

1	9.21	9.632×10^{-5}
2	17.5	1.99×10^{-4}
3	26.5	2.89×10^{-4}
4	94.5	8.7×10^{-4}
5	166.5	1.15×10^{-3}
6	310.5	1.27×10^{-3}
7	598.5	1.341×10^{-3}
8	1174.5	1.38×10^{-3}
9	1534.5	1.42×10^{-3}
10	1750	1.45×10^{-3}
11	1966	1.52×10^{-3}
12	2182	1.61×10^{-3}
13	2758	1.70×10^{-3}
14	3799	1.80×10^{-3}
15	6025	1.83×10^{-3}
16		

Specimen Z10 Isothermally Transformed at 350°C length = 23.78 mm $M_{eq} = 1369$
 Maximum length change = $3.41 \times 10^{-3} \Delta L/L$ $\tau = 32s$

Time (t- τ)/s	$\Delta L/L$
57	1.904×10^{-4}
129	6.481×10^{-4}
201	1.505×10^{-3}
273	2.12×10^{-3}
345	2.543×10^{-3}
489	2.95×10^{-3}
777	3.23×10^{-3}
1209	3.38×10^{-3}
1425	3.40×10^{-3}

Specimen Z5 Isothermally transformed at 350°C length = 23.78 mm $M_{eq} = 1369$
 Max length change = $3.96 \times 10^{-3} \Delta L/L$ $\tau = 28.3$

Time (t- τ)/s	$\Delta L/L$
57	1.47×10^{-4}
129	4.45×10^{-4}
201	1.186×10^{-3}
273	2.21×10^{-3}
345	2.878×10^{-3}
417	3.241×10^{-3}
561	3.579×10^{-3}
849	3.803×10^{-3}
1425	3.916×10^{-3}
3182	3.95×10^{-3}

Specimen Z2 Isothermally transformed at 351°C length = 23.78 mm $M_{0.5} = 1369$

Max length change = $4.15 \times 10^{-3} \Delta L/L$ $T = 14.05$

Time (t - t_c)/s	$\Delta L/L$
72	2.18×10^{-4}
144	5.59×10^{-4}
216	1.345×10^{-3}
288	2.28×10^{-3}
360	2.94×10^{-3}
432	3.317×10^{-3}
576	3.708×10^{-3}
864	3.984×10^{-3}
1440	4.12×10^{-3}

Specimen Z6 Isothermally transformed at 421°C length = 23.78 mm $M_{0.5} = 1369$

Max. length change = $3.33 \times 10^{-3} \Delta L/L$ $T = 41.2$

Time (t - t_c)/s	$\Delta L/L$
65	6.45×10^{-5}
137	2.30×10^{-4}
209	4.61×10^{-4}
281	7.62×10^{-4}
353	1.118×10^{-3}
425	1.465×10^{-3}
569	2.104×10^{-3}
785	2.703×10^{-3}
1217	3.148×10^{-3}
2308	3.32×10^{-3}

Specimen Z8 Isothermally transformed at 391°C length = 23.78 mm Mag = 1369

Max length change $\frac{\Delta L}{L} = 3.32 \times 10^{-3}$ $\tau = 31s$

time (t - τ)/s	$\Delta L/L$
84	1.444×10^{-4}
156	4.24×10^{-4}
228	8.05×10^{-4}
300	1.19×10^{-3}
372	1.50×10^{-3}
516	2.06×10^{-3}
660	2.42×10^{-3}
948	2.92×10^{-3}
1524	3.23×10^{-3}
1963	3.31×10^{-3}

Specimen Z4 Isothermally transformed at 444°C length 23.78 mm Mag = 1369

Max length change $\Delta L/L = 3.82 \times 10^{-3}$ $\tau = 28.3s$

time (t - τ)/s	$\Delta L/L$
72	1.474×10^{-4}
144	3.44×10^{-4}
216	6.2×10^{-4}
360	1.296×10^{-3}
504	1.908×10^{-3}
648	2.335×10^{-3}
936	2.765×10^{-3}
1587	2.97×10^{-3}
2268	3.01×10^{-3}

Specimen Z3 Isothermally transformed at 507°C length = 23.78 mm $\mu_{\text{eq}} = 1369$

Max length change = 2.88×10^{-3}

$\tau = 25.5$ s

time $(t - \tau)/s$	$\Delta L/L$
78	4.91×10^{-4}
150	1.41×10^{-3}
222	2.25×10^{-3}
294	2.59×10^{-3}
438	2.795×10^{-3}
1401	2.80×10^{-3}

Specimen Z1 Isothermally transformed at 476°C length = 23.78 mm $\mu_{\text{eq}} = 1369$

Max length change = 2.95×10^{-3} $\Delta L/L$

$\tau = 26.4$ s

time $(t - \tau)/s$	$\Delta L/L$
	1.229×10^{-4}
57	1.843×10^{-4}
129	6.45×10^{-4}
201	1.27×10^{-3}
273	1.843×10^{-3}
345	2.25×10^{-3}
417	2.52×10^{-3}
525	2.72×10^{-3}
669	2.83×10^{-3}
1101	2.94×10^{-3}

AVRAMI analysis 20/3/81

Fe 4.08Ni 2.05Si 0.39C Specimens Y and Z series

Identification	.PROG (i.e. plotted vs. $\ln(t-z)$)		.PROG2 (i.e. plotted vs. $\ln t$)		
	n (3 data points)	n (five data points)	n (3 data points)	n (five data points)	
Y1 350°C	1.36	1.68	1.83	2.13	
Y8 360°C	1.47	1.47	2.38	2.15	
Y6 408°C	1.47	1.47	2.01	1.89	
Y2 443°C	1.92	2.02	3.02	2.66	
Y5 455°C	1.32	1.32	2.48	2.15	
Y9 660°C	1.10	1.01	2.84	1.62	Not α _B
Z1 476°C	1.71	1.74	2.16	2.09	
Z2 351°C	1.76	1.99	1.98	2.18	
Z3 507°C	2.03	1.93	2.44	2.21	Not α _B
Z4 444°C	1.37	1.55	1.70	1.81	
Z5 350°C	1.73	2.00	2.23	2.46	
Z6 421	1.74	1.78	2.38	2.30	
Z8 391	1.83	1.77	2.26	2.10	
Z10 350	1.81	1.80	2.39	2.25	

(Plotted vs.) Slope is
i.e. $\ln t$ of linear
portion
- PROG 22
n $\ln k$

2.52 -15.09

2.38 -12.86

1.95 -11.60

2.27 -13.95

2.28 -13.17

2.84 -12.92

2.14 -12.18

2.63 -15.26

2.21 -11.84

1.85 -11.63

2.95 -17.08

2.18 -13.93

2.07 -12.79

2.34 -13.36

Dilatometric Analysis of 0.22C 3mm 2Si alloy.

7/9/81

Expansivities.

Pt/Pt-Ir thermocouple

- ① To obtain the linear expansivity of ferrite, the specimen was transformed from γ and reheated to 650°C. It was annealed at 650°C for 2 hours, cooled to room temp. The expansion coefficient was then measured by means of a slow heating experiment.

$$\text{Pen movement (Nominal mag 10000)} = 122 \text{ mm (temp. range } 676^\circ\text{C} \rightarrow 362^\circ\text{C)}$$

$$\text{Specimen length (X8)} = 21.75 \text{ mm}$$

$$\text{Actual calibrated mag} = 1369$$

$$\therefore \text{linear expansivity of ferrite} = \frac{122}{21.75 \times 1369 \times (676 - 362)} \\ = 1.3049 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

- ② For austenite

$$\text{Pen movement (Nominal mag 10000)} = 41.4 \text{ mm (temp range } 996 \rightarrow 927)$$

$$\therefore \text{linear exp of } \gamma = \frac{41.4}{21.75 \times 1369 \times (996 - 927)}$$

$$= 2.015 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

In both the above measurements, heating ^{or cooling} rate = 7°C per min.

Average parameters (Prog. 22)

	T/°C	n	lnk
X1	353	1.6982	-10.3107
X2	380	1.3488	-8.449
X3	408	1.2699	-8.0676
X4	430	1.1021	-6.5519
X5	454	1.0422	-5.7549
V3	456	0.8017	-5.2094
V4	409	1.1960	-6.3794
V5	357	0.8438	-3.8946
V6	304		

Specimen x1 Isothermally transformed at 353°C $M_{95}=1369$ Spec. length = 21.75mm

$(t-\tau)/s$

$\Delta L/L$

$$\tau = 27.6$$

$$(\Delta L/L)_{max} = 2.3505 \times 10^{-3}$$

36	6×10^{-5}
72	1.83×10^{-4}
108	3.00×10^{-4}
144	4.5×10^{-4}
216	7.602×10^{-4}
288	1.034×10^{-3}
360	1.30×10^{-3}
432	1.49×10^{-3}
540	1.70×10^{-3}
684	1.884×10^{-3}
972	2.067×10^{-3}
1548	2.25×10^{-3}

Specimen x2 Isothermally transformed at 380°C $M_{95}=1369$ Spec. length = 21.75mm

$(t-\tau)/s$

$\Delta L/L$

$$\tau = 20.55$$

$$(\Delta L/L)_{max} = 2.434 \times 10^{-3}$$

52	2.69×10^{-4}
88	3.63×10^{-4}
124	4.03×10^{-4}
196	6.45×10^{-4}
268	8.40×10^{-4}
341	1.067×10^{-3}
448	1.403×10^{-3}
592	1.753×10^{-3}
880	2.132×10^{-3}
1456	2.35×10^{-3}

Specimen X3 Isothermally transformed at 408°C length = 21.75 mm $M_{\text{eq}} = 1369$

$(t - \tau)/s$

$\Delta L/L$

$\tau = 29s$

36 1.612×10^{-4}

$(\Delta L/L)_{\text{max}} = 2.00 \times 10^{-3}$

72 2.35×10^{-4}

108 3.02×10^{-4}

144 3.96×10^{-4}

216 5.71×10^{-4}

288 7.72×10^{-4}

396 1.03×10^{-3}

540 1.283×10^{-3}

828 1.625×10^{-3}

1404 1.907×10^{-3}

Specimen X4 Isothermally transformed at 430°C length = 21.75 mm $M_{\text{eq}} = 1369$

$(t - \tau)/s$

$\Delta L/L$

$\tau = 24$

51 3.02×10^{-4}

$(\Delta L/L)_{\text{max}} = 1.53 \times 10^{-3}$

123 4.433×10^{-4}

195 6.48×10^{-4}

267 8.06×10^{-4}

339 9.4×10^{-4}

483 1.13×10^{-3}

771 1.29×10^{-3}

1347 1.431×10^{-3}

Specimen X5 Isothermally transformed at 454°C length = 21.75 mm $M_{\text{ag}} = 1369$

$(t - \tau)/s$ $\Delta L/L$

$\tau = 16.0$

$(\Delta L/L)_{\text{max}} = 9.57 \times 10^{-4}$

15	1.04×10^{-4}
65	2.69×10^{-4}
137	3.96×10^{-4}
209	5.54×10^{-4}
317	7.15×10^{-4}
461	8.295×10^{-4}
749	9.20×10^{-4}

Specimen V3 Isothermally transformed at 456°C length = 22.55 mm $M_{\text{ag}} = 1369$

$(t - \tau)/s$ $\Delta L/L$

$\tau = 26 s$

$(\Delta L/L)_{\text{max}} = 1.3 \times 10^{-3}$

19	1.35×10^{-4}
91	2.95×10^{-4}
163	4.01×10^{-4}
271	5.46×10^{-4}
415	6.74×10^{-4}
703	8.54×10^{-4}
1279	1.05×10^{-3}

Specimen V4 Isothermally transformed at 409°C length = 22.55 mm $M_{\text{ag}} = 1369$

$(t - \tau)/s$ $\Delta L/L$

$\tau = 15$

$(\Delta L/L)_{\text{max}} = 2.413 \times 10^{-3}$

33	3.95×10^{-4}
69	6.64×10^{-4}
105	9.72×10^{-4}
141	1.25×10^{-3}
177	1.46×10^{-3}
249	1.77×10^{-3}
357	2.02×10^{-3}
501	2.21×10^{-3}
933	2.37×10^{-3}

Specimen v5 Isothermally transformed at 357°C Mag = 1369 Spec. length = 22.55 mm

$(t - \tau)/s$ $\Delta L/L$

$$\tau = \text{5.9} \text{ s}$$

$$(\Delta L/L)_{\max} = 2.407 \times 10^{-3}$$

7	1.62×10^{-4}
35	9×10^{-4}
53	1.12×10^{-3}
71	1.29×10^{-3}
107	1.64×10^{-3}
143	1.82×10^{-3}
215	2.07×10^{-3}
359	2.27×10^{-3}
647	2.37×10^{-3}

Specimen v6 Isothermally transformed at 308°C Mag = 1369 Spec length = 22.55 mm

$(t - \tau)/s$ $\Delta L/L$

$$\tau = 1$$

$$(\Delta L/L)_{\max} = 2.161 \times 10^{-3}$$

1.2	3.89×10^{-4}
1.8	5.57×10^{-4}
3.0	7.45×10^{-4}
4.2	8.6×10^{-4}
6.6	1.036×10^{-3}
13.8	1.3×10^{-3}
49.8	1.53×10^{-3}
122	1.74×10^{-3}
266	1.93×10^{-3}
554	2.08×10^{-3}

Dilatometric analysis of 300M steel (0.44C 1.74Si 0.67Mn 1.85Ni 0.83Cr
0.39Mo 0.09V)

Expansivities

a) Austenite

Specimen length = 20.58 mm. AP4

Nominal Mag = 10000

Actual Mag = 1369

Pen movement = 132 mm (over temp range 738 → 999°C)

$$\therefore \text{Expansivity of } \delta = \frac{132}{20.58 \times 1369 \times (999 - 738)}$$

$$= 1.7951 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

Cooling rate used = 5°C per min

b) Ferrite (Specimen transferred, cooled at 660°C cooled, heated).

Specimen length = 20.58 mm

Actual Mag = 1369

Pen movement = 127 mm (over temp range 80 - 486°C)

$$\therefore \text{Expansivity of } \alpha = \frac{127}{20.58 \times 1369 \times (486 - 80)}$$

$$= 1.1103 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

heating rate used = 7°C per min.

Aroni Parameters

	T/°C	n	lnk
Q4	440	1.8457	-11.0798
Q3	414	1.6985	-11.3023
Q2	380	2.8196	-17.8244
P4	425	1.2412	-8.4983
Q1	346	3.2446	-19.9924
AP3	397	2.1424	-14.2965
P2	352	2.0661	-12.9106
P3	391	1.5961	-10.7503
AP2	355	2.7130	-16.8977

Specimen AP1

length = 20.58 mm Isothermally transformed at 318°C $M_{eq} = 1369$

$(t - \tau)/s$

$\Delta L/L$

$\tau = 17$

$(\Delta L/L)_{max} = 3.9753 \times 10^{-3}$

36	7.81×10^{-5}
72	1.60×10^{-4}
108	2.48×10^{-4}
180	4.01×10^{-4}
252	5.86×10^{-4}
324	8.52×10^{-4}
396	1.33×10^{-3}
468	1.88×10^{-3}
540	2.34×10^{-3}
648	2.80×10^{-3}
792	3.14×10^{-3}
1080	3.47×10^{-3}
1656	3.73×10^{-3}

Specimen AP2

length = 20.78 mm Isothermally transformed at 355°C $M_{eq} = 1602$

$(t - \tau)/s$

$\Delta L/L$

$\tau = 65$

$(\Delta L/L)_{max} = 3.13 \times 10^{-3}$

36	4.51×10^{-5}
72	9.01×10^{-5}
108	1.5×10^{-4}
180	3.304×10^{-4}
252	7.15×10^{-4}
324	1.26×10^{-3}
396	1.802×10^{-3}
468	2.19×10^{-3}
576	2.53×10^{-3}
720	2.7997×10^{-3}
1008	2.99×10^{-3}
1584	3.1×10^{-3}

Specimen AP3 length = 20.58 mm $M_{eq} = 1369$ Isothermally transformed at 397°C

$(t - \tau)/s$ $\Delta L/L$

$$\tau = 90$$

$$(\Delta L/L)_{max} = 2.06 \times 10^{-3}$$

72	7.1×10^{-5}
144	1.42×10^{-4}
216	2.45×10^{-4}
324	4.54×10^{-4}
432	7.28×10^{-4}
540	8.38×10^{-4}
684	1.33×10^{-3}
828	1.56×10^{-3}
1116	1.81×10^{-3}
1692	1.97×10^{-3}
2268	2.02×10^{-3}

Specimen P1 length = 17.50 mm $M_{eq} = 1369$ Isothermally transformed at 318°C

$(t - \tau)/s$ $\Delta L/L$

$$\tau = 26$$

$$(\Delta L/L)_{max} = 3.78 \times 10^{-3}$$

69	1.795×10^{-4}
105	2.71×10^{-4}
141	3.55×10^{-4}
177	4.38×10^{-4}
249	6.26×10^{-4}
321	8.68×10^{-4}
393	1.28×10^{-3}
465	1.79×10^{-3}
537	2.27×10^{-3}
609	2.63×10^{-3}
681	2.87×10^{-3}
825	3.16×10^{-3}
1113	3.44×10^{-3}
1689	3.63×10^{-3}

Specimen P2 Isothermally transformed at 352°C length = 17.50 mm $M_{\text{eq}} = 1369$

$(t - \tau)/s$ $\Delta L/L$

$$\tau = 28$$

$$(\Delta L/L)_{\text{max}} = 3.18 \times 10^{-3}$$

68	1.36×10^{-4}
104	2.17×10^{-4}
140	3.0×10^{-4}
176	3.97×10^{-4}
248	6.30×10^{-4}
320	1.04×10^{-3}
392	1.55×10^{-3}
464	2.0×10^{-3}
536	2.32×10^{-3}
680	2.69×10^{-3}
968	2.97×10^{-3}
1544	3.13×10^{-3}

Specimen P3 Isothermally transformed at 391°C length = 17.50 mm $M_{\text{eq}} = 1369$

$(t - \tau)/s$ $\Delta L/L$

$$\tau = 43$$

$$(\Delta L/L)_{\text{max}} = 2.33 \times 10^{-3}$$

51	6.7×10^{-5}
123	1.92×10^{-4}
195	2.96×10^{-4}
267	4.00×10^{-4}
375	5.93×10^{-4}
483	8.35×10^{-4}
591	1.1×10^{-3}
735	1.41×10^{-3}
879	1.63×10^{-3}
1023	1.80×10^{-3}
1311	2×10^{-3}
1887	2.17×10^{-3}

Specimen P4 Isothermally transformed at 425°C length = 17.50 mm $M_{\text{avg}} = 1369$

$(t - \tau)/s$

$\Delta L/L$

$$\tau = 85$$

$$(\Delta L/L)_{\text{max}} = 5.092 \times 10^{-4}$$

84	7.51×10^{-5}
192	1.46×10^{-4}
336	2.25×10^{-4}
516	3.13×10^{-4}
804	4.17×10^{-4}
1380	5.47×10^{-4}
2532	6.47×10^{-4}

Specimen Q1 Isothermally transformed at 346°C length = 19.74 mm $M_{\text{avg}} = 1369$

$(t - \tau)/s$

$\Delta L/L$

$$\tau = 72$$

$$(\Delta L/L)_{\text{max}} = 3.72 \times 10^{-3}$$

72	7.4×10^{-5}
144	2.7×10^{-4}
216	7.07×10^{-4}
288	1.34×10^{-3}
360	1.98×10^{-3}
432	2.46×10^{-3}
540	2.91×10^{-3}
684	3.20×10^{-3}
972	3.45×10^{-3}
1548	3.60×10^{-3}

Specimen Q2	Isothermally transformed at 380°C length = 19.74 mm $m_{\text{av}} = 1369$	
$(t - \tau)/s$	$\Delta L/L$	$\tau = 88$
72	7.4×10^{-5}	$(\Delta L/L)_{\text{max}} = 2.71 \times 10^{-3}$
144	2.29×10^{-4}	
216	4.81×10^{-4}	
288	7.77×10^{-4}	
360	1.13×10^{-3}	
432	1.46×10^{-3}	
504	1.73×10^{-3}	
612	2.04×10^{-3}	
756	2.29×10^{-3}	
1044	2.53×10^{-3}	
1620	2.65×10^{-3}	

Specimen Q3	Isothermally transformed at 414°C length = 19.74 mm $m_{\text{av}} = 1369$	
$(t - \tau)/s$	$\Delta L/L$	$\tau = 94s$
85	7.4×10^{-5}	$(\Delta L/L)_{\text{max}} = 1.295 \times 10^{-3}$
157	1.7×10^{-4}	
229	2.66×10^{-4}	
301	3.63×10^{-4}	
409	5.0×10^{-4}	
517	6.2×10^{-4}	
625	7.48×10^{-4}	
769	8.77×10^{-4}	
1057	1.06×10^{-3}	
1633	1.20×10^{-3}	

Specimen Q4 Isothermally fractured at 440°C length = 19.74 mm avg = 1369

$(t-x)/s$

$\Delta L/L$

$\bar{L} = 113$

$(\Delta L/L)_{\max} = 2.22 \times 10^{-4}$

58	3.7×10^{-5}
94	5.55×10^{-5}
130	7.77×10^{-5}
166	9.62×10^{-5}
238	1.184×10^{-4}
310	1.39×10^{-4}
454	1.57×10^{-4}
742	1.85×10^{-4}
1318	2.035×10^{-4}