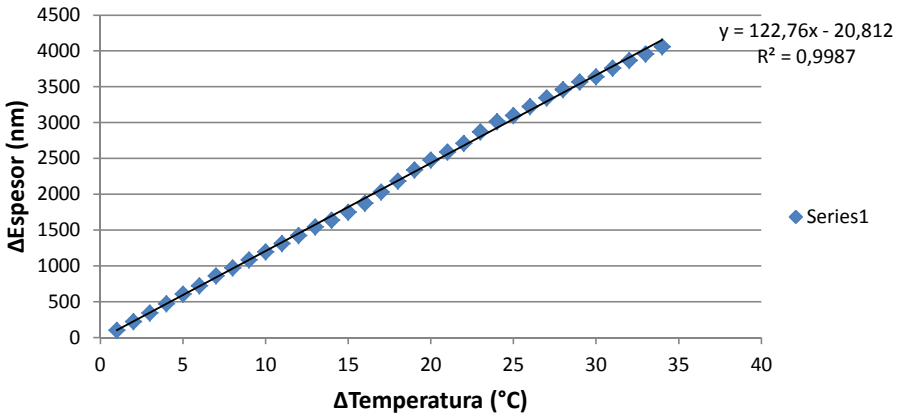
ANEXO II

CÁLCULOS PARA LA OBTENCIÓN DE LOS CTE

EVA 12%

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	102,291	102,291
2	118,473	220,764
3	122,310	343,075
4	128,775	471,850
5	135,561	607,411
6	116,637	724,048
7	135,712	859,760
8	113,440	973,200
9	109,774	1082,975
10	115,241	1198,216
11	115,900	1314,116
12	109,855	1423,971
13	122,708	1546,679
14	93,030	1639,709
15	110,043	1749,751
16	126,600	1876,351
17	157,639	2033,990
18	148,106	2182,096
19	159,174	2341,271
20	137,707	2478,978
21	113,427	2592,405
22	117,074	2709,479
23	160,283	2869,762
24	146,099	3015,860
25	85,265	3101,126
26	123,445	3224,570
27	119,989	3344,560
28	115,945	3460,505
29	109,697	3570,202
30	68,062	3638,264
31	120,251	3758,515
32	107,638	3866,152
33	89,716	3955,869
34	103,804	4059,673



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

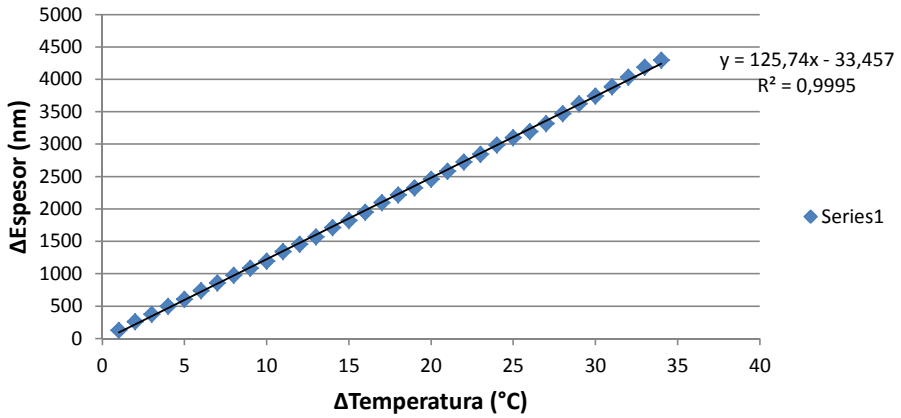
El espesor inicial de la muestra es L_0 = 180,33 nm

$$m_{\text{EVA 12\%}} = m_{Conjunto} - m_{Porta\ metálico} = 122.76\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 73.605\ {}^{nm}/_{°C}$$

$$CTE\ (EVA\ 12\%) = \frac{73.605 \cdot 10^{-9}\ {}^{m}/_{°C}}{180.33 \cdot 10^{-6}\ m} = 4.09 \times 10^{-4} °C^{-1}$$

EVA 18%

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	128,840	128,840
2	133,712	262,552
3	111,973	374,524
4	125,074	499,598
5	108,549	608,148
6	129,829	737,977
7	120,594	858,571
8	119,724	978,295
9	106,843	1085,137
10	107,127	1192,264
11	152,470	1344,734
12	109,251	1453,985
13	114,478	1568,463
14	143,270	1711,733
15	110,130	1821,863
16	130,033	1951,896
17	148,226	2100,122
18	116,311	2216,433
19	108,847	2325,279
20	131,627	2456,906
21	127,699	2584,605
22	138,796	2723,401
23	121,256	2844,658
24	141,176	2985,833
25	115,777	3101,610
26	93,217	3194,828
27	123,270	3318,098
28	154,322	3472,420
29	153,055	3625,476
30	116,488	3741,964
31	145,937	3887,901
32	145,678	4033,580
33	153,792	4187,372
34	108,549	4295,921



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

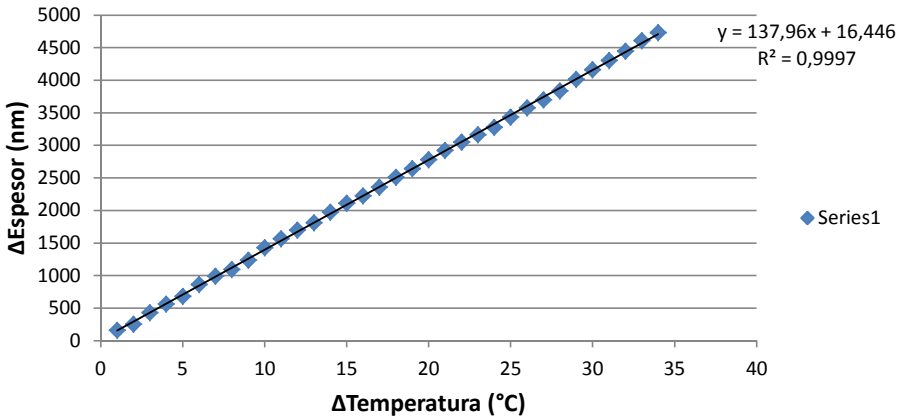
El espesor inicial de la muestra es L_0 = 175.67 nm

$$m_{\text{EVA 18\%}} = m_{Conjunto} - m_{Porta\ metálico} = 125{,}74\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 76.585\ {}^{nm}/_{°C}$$

$$CTE\ (EVA\ 18\%) = \frac{76.585 \cdot 10^{-9}\ {}^{m}/_{°C}}{175.67 \cdot 10^{-6}\ m} = 4.36 \times 10^{-4} °C^{-1}$$

EVA 25%

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	162,045	162,045
2	92,739	254,784
3	175,331	430,114
4	135,318	565,433
5	115,852	681,284
6	183,260	864,544
7	127,673	992,218
8	103,807	1096,025
9	139,572	1235,597
10	195,340	1430,937
11	135,700	1566,637
12	132,997	1699,634
13	111,756	1811,390
14	165,924	1977,314
15	134,096	2111,410
16	111,921	2223,331
17	136,065	2359,396
18	149,868	2509,264
19	136,365	2645,629
20	134,555	2780,184
21	143,694	2923,878
22	129,309	3053,187
23	112,137	3165,324
24	112,868	3278,192
25	155,130	3433,323
26	144,954	3578,277
27	120,836	3699,113
28	140,888	3840,001
29	176,578	4016,580
30	144,896	4161,476
31	144,541	4306,016
32	141,903	4447,919
33	163,102	4611,021
34	121,108	4732,129



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

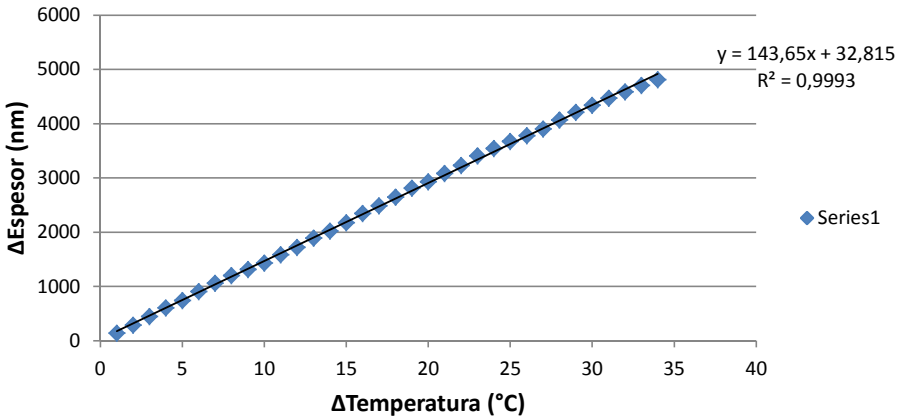
El espesor inicial de la muestra es L_0 = 188.67 nm

$$m_{\text{EVA 25\%}} = m_{Conjunto} - m_{Porta\ metálico} = 137{,}96\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 88.805\ {}^{nm}/_{°C}$$

$$CTE\ (EVA\ 25\%) = \frac{88.805 \cdot 10^{-9}\ {}^{m}/_{°C}}{188.67 \cdot 10^{-6}\ m} = 4.71 \times 10^{-4}\,°C^{-1}$$

EVA 30%

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	140,348	140,348
2	150,165	290,513
3	154,222	444,735
4	160,125	604,860
5	139,643	744,503
6	162,646	907,150
7	150,579	1057,729
8	146,409	1204,138
9	108,514	1312,651
10	120,801	1433,452
11	154,953	1588,405
12	135,593	1723,998
13	169,393	1893,390
14	128,659	2022,049
15	155,518	2177,568
16	168,575	2346,142
17	141,699	2487,841
18	158,256	2646,098
19	164,088	2810,186
20	122,456	2932,641
21	149,299	3081,940
22	151,064	3233,004
23	175,214	3408,219
24	138,214	3546,433
25	124,751	3671,184
26	108,077	3779,261
27	125,165	3904,426
28	166,050	4070,476
29	141,007	4211,483
30	130,088	4341,571
31	127,182	4468,753
32	119,660	4588,413
33	114,329	4702,742
34	108,478	4811,220



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

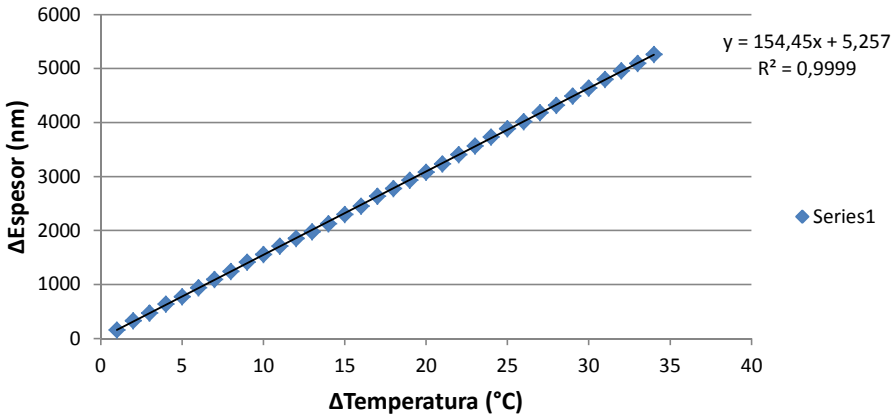
El espesor inicial de la muestra es L_0 = 185,00 nm

$$m_{\text{EVA 30\%}} = m_{Conjunto} - m_{Porta\ metálico} = 143.65\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 94.495\ {}^{nm}/_{°C}$$

$$CTE\ (EVA\ 30\%) = \frac{94.495 \cdot 10^{-9}\ {}^{m}/_{°C}}{185 \cdot 10^{-6}\ m} = 5.11 \times 10^{-4} °C^{-1}$$

EVA 40%

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	156,527	156,527
2	172,806	329,333
3	143,907	473,240
4	163,251	636,491
5	140,513	777,004
6	165,132	942,136
7	152,709	1094,845
8	148,953	1243,798
9	169,195	1412,993
10	144,305	1557,298
11	156,139	1713,437
12	141,531	1854,968
13	125,591	1980,559
14	147,256	2127,815
15	170,786	2298,601
16	154,966	2453,567
17	184,692	2638,259
18	137,684	2775,943
19	158,379	2934,322
20	144,369	3078,692
21	157,296	3235,988
22	171,817	3407,805
23	161,056	3568,861
24	161,482	3730,343
25	159,569	3889,912
26	125,601	4015,513
27	166,431	4181,944
28	135,076	4317,020
29	172,580	4489,600
30	149,008	4638,608
31	163,118	4801,726
32	160,535	4962,261
33	132,318	5094,580
34	168,048	5262,627



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

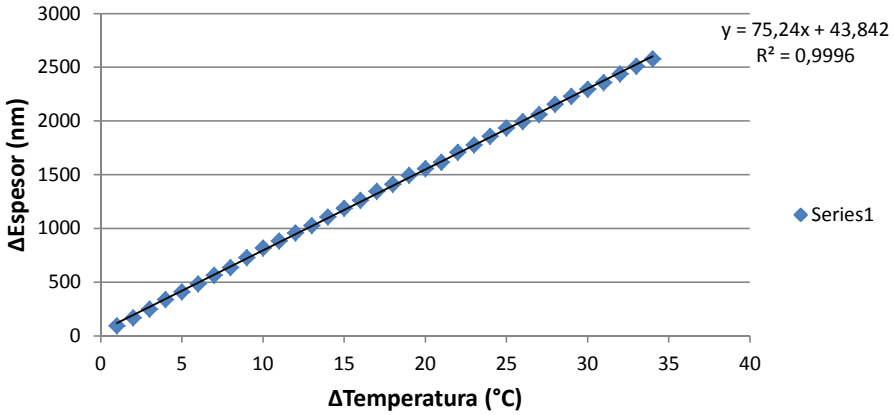
El espesor inicial de la muestra es L_0 = 189,33 nm

$$m_{\text{EVA 40\%}} = m_{Conjunto} - m_{Porta\ metálico} = 154.45\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 105.295\ {}^{nm}/_{°C}$$

$$CTE\ (EVA\ 40\%) = \frac{105.295 \cdot 10^{-9}\ {}^{m}/_{°C}}{189.33 \cdot 10^{-6}\ m} = 5.56 \times 10^{-4}\ °C^{-1}$$

PMMA 25000

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	95,160	95,160
2	74,103	169,263
3	81,034	250,297
4	88,591	338,888
5	72,442	411,330
6	74,456	485,786
7	79,068	564,854
8	73,201	638,055
9	90,066	728,121
10	90,056	818,177
11	64,884	883,061
12	76,498	959,559
13	67,095	1026,654
14	81,971	1108,625
15	80,365	1188,990
16	73,318	1262,307
17	83,571	1345,879
18	65,585	1411,464
19	82,143	1493,607
20	64,473	1558,080
21	59,143	1617,223
22	91,782	1709,005
23	68,504	1777,509
24	81,470	1858,980
25	76,557	1935,536
26	59,586	1995,122
27	64,499	2059,621
28	95,131	2154,752
29	75,115	2229,867
30	66,895	2296,762
31	60,429	2357,191
32	80,348	2437,540
33	73,418	2510,957
34	68,572	2579,530



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

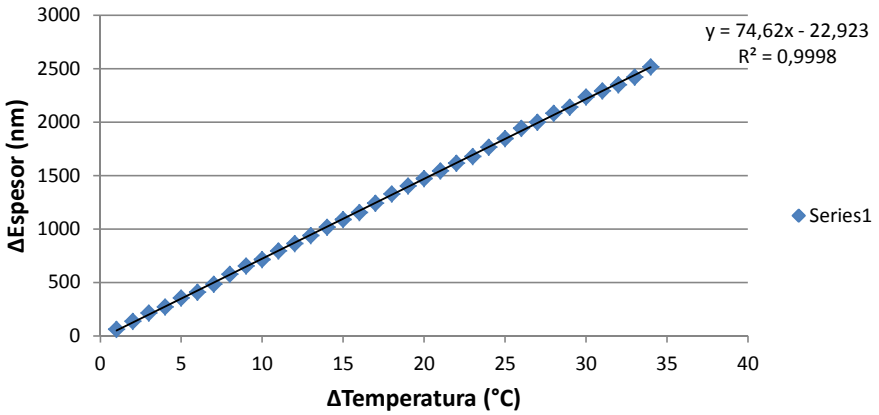
El espesor inicial de la muestra es L_0 = 169,33 nm

$$m_{\text{PMMA 25000}} = m_{Conjunto} - m_{Porta\,metálico} = 75.24\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 26.085\ {}^{nm}/_{°C}$$

$$CTE\ (PMMA\ 25000) = \frac{26.085 \cdot 10^{-9}\ {}^{m}/_{°C}}{169.33 \cdot 10^{-6}\ m} = 1.54 \times 10^{-4} °C^{-1}$$

PMMA 65000

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	63,045	63,045
2	75,212	138,257
3	76,886	215,143
4	56,415	271,558
5	84,095	355,653
6	54,187	409,840
7	74,950	484,790
8	91,915	576,705
9	77,672	654,376
10	61,752	716,128
11	80,462	796,590
12	68,391	864,981
13	74,814	939,795
14	76,563	1016,358
15	71,792	1088,150
16	67,780	1155,930
17	85,291	1241,222
18	87,893	1329,115
19	73,964	1403,079
20	69,506	1472,585
21	72,257	1544,843
22	71,158	1616,001
23	62,621	1678,622
24	87,046	1765,669
25	80,597	1846,266
26	94,407	1940,673
27	58,118	1998,791
28	82,430	2081,221
29	58,057	2139,278
30	97,297	2236,575
31	54,718	2291,292
32	58,438	2349,730
33	71,391	2421,121
34	94,210	2515,331



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

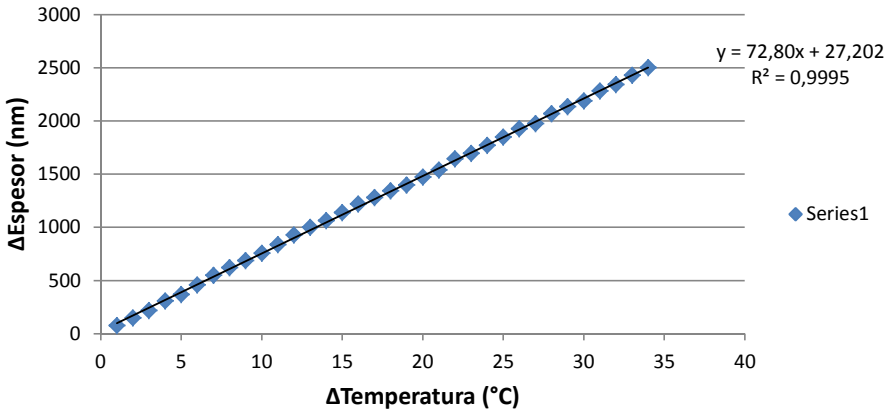
El espesor inicial de la muestra es L_0 = 183,33 nm

$$m_{\text{PMMA 65000}} = m_{Conjunto} - m_{Porta\ metálico} = 74.62\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 25.465\ {}^{nm}/_{°C}$$

$$CTE\ (PMMA\ 65000) = \frac{25.465 \cdot 10^{-9}\ {}^{m}/_{°C}}{183.33 \cdot 10^{-6}\ m} = 1.39 \times 10^{-4} °C^{-1}$$

PMMA 75000

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	76,890	76,890
2	72,135	149,024
3	70,441	219,465
4	89,438	308,903
5	61,516	370,419
6	89,406	459,825
7	88,999	548,824
8	73,350	622,174
9	66,361	688,535
10	69,687	758,222
11	79,860	838,083
12	92,238	930,321
13	71,785	1002,106
14	61,603	1063,709
15	75,862	1139,570
16	79,915	1219,486
17	60,397	1279,883
18	64,396	1344,279
19	53,143	1397,422
20	76,663	1474,085
21	66,668	1540,754
22	102,692	1643,445
23	53,589	1697,035
24	75,396	1772,431
25	76,615	1849,046
26	79,172	1928,218
27	48,589	1976,806
28	90,754	2067,560
29	66,536	2134,096
30	54,330	2188,426
31	92,761	2281,187
32	61,849	2343,036
33	86,196	2429,232
34	71,695	2500,927



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

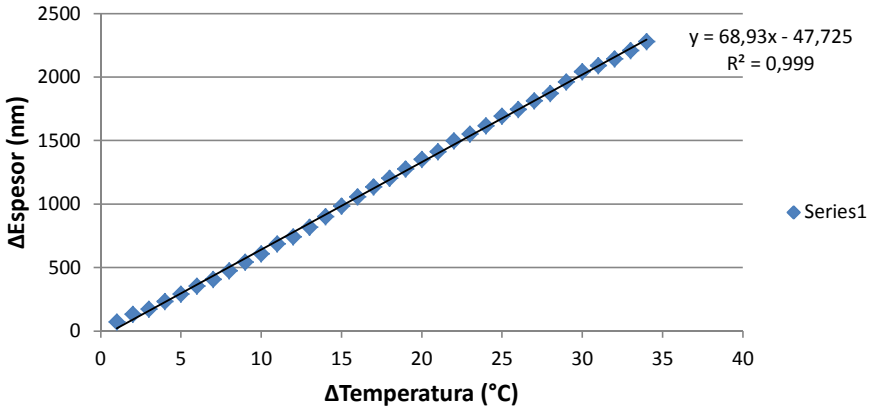
El espesor inicial de la muestra es L_0 = 184,67 nm

$$m_{\text{PMMA 75000}} = m_{Conjunto} - m_{Porta\ metálico} = 72.80\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 23.645\ {}^{nm}/_{°C}$$

$$CTE\ (PMMA\ 75000) = \frac{23.645 \cdot 10^{-9}\ {}^{m}/_{°C}}{184.67 \cdot 10^{-6}\ m} = 1.28 \times 10^{-4} °C^{-1}$$

PMMA 350000

ΔT (ºC)	Δespersor/grado	Δespersor acumulado conjunto
1	72,681	72,681
2	59,198	131,879
3	42,647	174,526
4	60,423	234,949
5	56,421	291,370
6	64,570	355,940
7	50,551	406,491
8	70,214	476,705
9	68,113	544,819
10	63,710	608,529
11	79,472	688,002
12	55,810	743,812
13	73,777	817,588
14	84,926	902,514
15	81,486	984,000
16	74,459	1058,459
17	77,071	1135,530
18	68,294	1203,824
19	74,064	1277,888
20	73,693	1351,581
21	60,801	1412,382
22	86,762	1499,144
23	53,405	1552,549
24	63,704	1616,253
25	75,335	1691,588
26	53,560	1745,148
27	67,981	1813,129
28	58,296	1871,425
29	91,401	1962,825
30	80,888	2043,714
31	45,822	2089,535
32	53,609	2143,144
33	64,774	2207,918
34	70,719	2278,637



La pendiente de la variación del espesor (Porta metálico) es $m_{\text{Porta metálico}}$ = 49.155 nm/°C.

El espesor inicial de la muestra es L_0 = 199,00 nm

$$m_{\text{PMMA 350000}} = m_{Conjunto} - m_{Porta\ metálico} = 68.93\ {}^{nm}/_{°C} - 49.155\ {}^{nm}/_{°C} = 19.775\ {}^{nm}/_{°C}$$

$$CTE\ (PMMA\ 350000) = \frac{19.775 \cdot 10^{-9}\ {}^{m}/_{°C}}{199 \cdot 10^{-6}\ m} = 0.99 \times 10^{-4} °C^{-1}$$