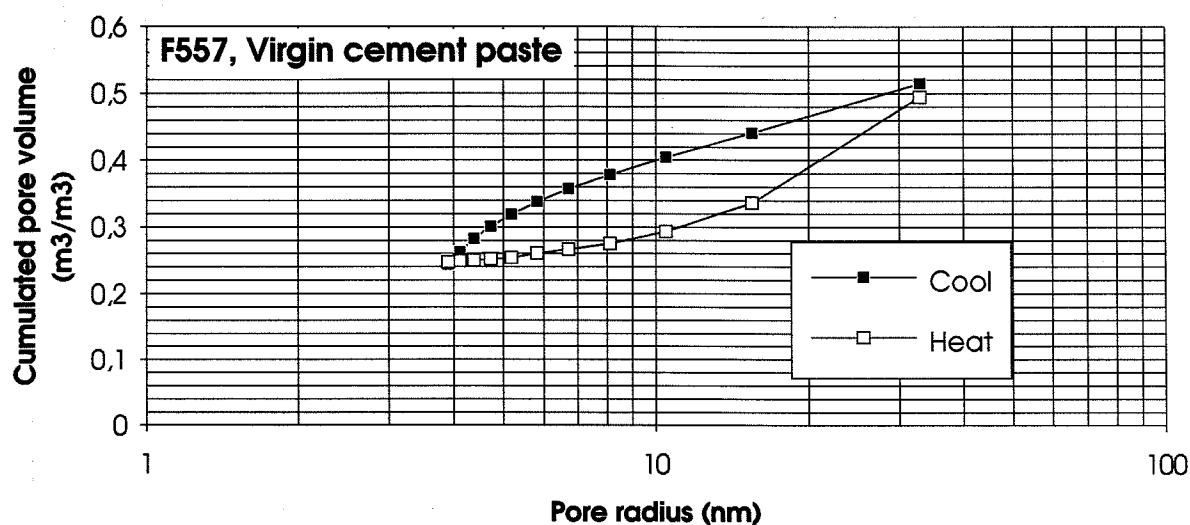


The Computer Program

PORESIZE

User Instructions



Lubica Wessman

Jens Villadsen

Kurt Kielsgaard Hansen

1993

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Preface

The aim of this work has been to write a Lotus SYMPHONY program that computes and plots the cumulated pore volume as a function of pore radius in a sample. The input of this program could be found from the results of another program, IS1988 [1], which computes the amount of ice at different freezing-point depressions. The input of the program IS1988 could be found from the results of a run with the SETARAM CALVET low temperature microcalorimeter [2], at Building Materials Laboratory (LBM), the Technical University of Denmark.

The program described in this report is made by Lubica Wessman while she was a guest researcher at LBM. The method used in the program is developed by Jens Villadsen, LBM [3]. He made a working sheet, shown in appendix 1, which is filled in by hand calculations. The SYMPHONY-program PORESIZE performs the same calculations automatically. The method is based on an article - *Determination of pore-size distribution from freezing-point depression* - written by Göran Fagerlund 1973 [4]. All formulas used by Jens Villadsen and in the program PORESIZE originate from that article.

Schematic description of working steps

L B M Laboratoriet for bygningsmaterialer. Danmarks tekniske høgskole.
Building materials laboratory. The technical university of Denmark.

TEST NO. F557 COOL

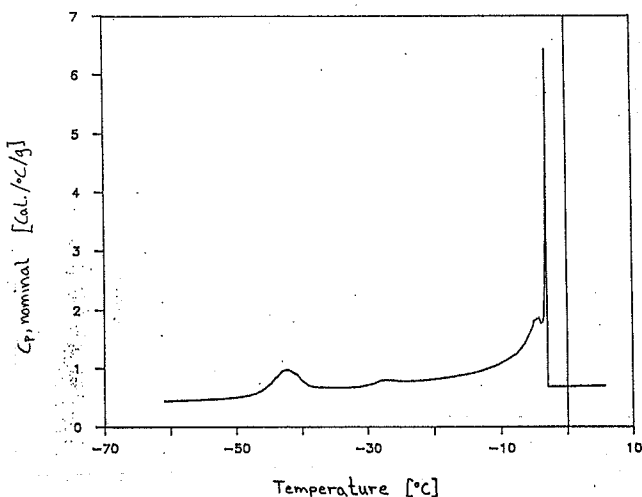
11.JAN.1988

sample no. : 0
sample weight : 0.6250 gram
sample description :
Jomfruelig, Agt = 0.00271g.

F557.cool

start time : 162043

t	ts	tc	EI	Dq/Dt	App. Heat Capacity	Integrated	Dt/Dt
Time	Lab/sec	Deg.C	Hvot	Mcal/sec/g	nominal	true	
				Cal/deg/g	cal/g	Mdeg/sec	
162057	12	5.71	704	0.4302	-0.4453	0.1093	0.005
162106	23	5.76	705	0.4308	-0.4459	0.0945	0.010
162113	28	5.71	707	0.4320	-0.4472	-0.0437	0.012
162227	102	5.68	708	0.4314	-0.4465	-0.6578	0.044
162419	214	5.57	705	0.4308	-0.4465	-0.4841	0.022
162544	380	6.37	702	0.4290	-0.4441	-0.3191	0.155
162651	486	5.27	704	0.4303	-0.4454	-0.5578	0.209
163107	623	5.03	705	0.4309	-0.4461	-0.2410	0.268
164714	1590	4.05	701	0.4287	-0.4458	-0.4245	0.693
170338	2653	3.03	697	0.4265	-0.4415	-0.4589	1.153
172244	3720	2.05	695	0.4255	-0.4405	-0.4473	1.590
174012	4768	1.03	692	0.4240	-0.4389	-0.4335	2.034
175741	5816	0.05	689	0.4224	-0.4372	-0.4533	2.477
175914	5909	-0.05	691	0.4228	-0.4385	-0.4037	2.517
175915	5910	0.05	691	0.4238	-0.4385	0.0059	2.517
175921	5917	-0.05	689	0.4224	-0.4373	-0.0273	2.520
175923	5918	0.05	691	0.4236	-0.4385	0.0066	2.521
175935	5930	-0.05	689	0.4224	-0.4373	-0.0509	2.525
175937	5932	0.05	690	0.4230	-0.4379	0.0065	2.526
175938	5933	-0.05	691	0.4238	-0.4385	-0.0052	2.527
175938	5934	0.05	691	0.4238	-0.4385	0.0031	2.527
175941	5937	-0.05	689	0.4224	-0.4373	-0.0119	2.528
175945	5940	0.05	693	0.4248	-0.4398	0.0158	2.530
175948	5943	-0.05	690	0.4230	-0.4379	-0.0198	2.531
175950	5946	0.05	692	0.4242	-0.4392	0.0093	2.532
175951	5947	-0.05	692	0.4242	-0.4392	-0.0043	2.532
175952	5948	0.05	690	0.4230	-0.4379	0.0050	2.533
175954	5949	-0.05	691	0.4238	-0.4385	-0.0064	2.534
175955	5950	0.05	691	0.4238	-0.4385	0.0033	2.534
175955	5951	-0.05	692	0.4242	-0.4392	-0.0040	2.534
175956	5953	0.05	690	0.4230	-0.4379	0.0093	2.535
175959	5954	-0.05	690	0.4230	-0.4379	-0.0050	2.536
180009	5965	0.05	692	0.4242	-0.4392	0.0454	2.640
180012	5967	-0.05	690	0.4230	-0.4379	-0.0102	2.641
181634	6949	-1.03	691	0.4239	-0.4388	-0.4264	2.958
183340	7975	-2.00	690	0.4235	-0.4385	-0.4449	3.392
185101	9017	-3.03	689	0.4232	-0.4381	-0.4299	3.633
185218	9093	-2.98	698	0.4363	-0.5138	0.7749	3.671
185219	9095	-2.98	1079	0.6628	-0.8661	0.0000	3.672
185220	9095	-3.03	1345	0.8262	-0.8552	-0.0139	3.672
185221	9096	-2.98	1604	0.9852	-1.0199	0.0155	3.673
185221	9097	-3.03	1883	1.1666	-1.1973	-0.0144	3.674
185222	9097	-3.03	2168	1.3317	-1.3766	0.0000	3.675
185223	9098	-3.03	2444	1.5012	-1.5541	0.0000	3.676



Output from run with Setaram Calvet microcalorimeter.

Program IS1988.



```
*****
*****ISMAENGDER*****
*****FOR MIKROKALORIMETERKYSSEL NR. F557*****
*****
```

TEMPERATUR

			Ta gr.C	Tx gr.C	Tb gr.C	Tc gr.C	Td gr.C
			-3	-10	-20	-35	-55
I	COOL	g/gssd	0	0.051729	0.077573	0.103790	0.136665
S	INCREMENT	g/gdry	0	0.072937	0.109379	0.146344	0.192698
M	COOL	g/gssd					0.139649
AE	TOTAL	g/gdry					0.196906
N			4	-10	-20	-35	-55
G	HEAT	g/gssd	0	0.111178	0.129753	0.139932	0.143245
D	INCREMENT	g/gdry	0	0.156761	0.182952	0.197304	0.201976
E	HEAT	g/gssd					0.150155
R	TOTAL	g/gdry					0.211718

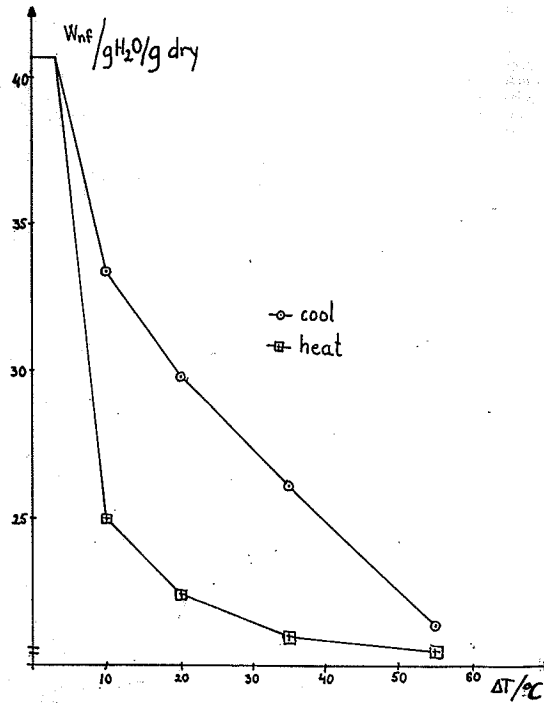
Output from program IS1988.



Calculations of w_{nf} using the formula

$$w_{nf}(\Delta T) = w_{es} - w_f(\Delta T) \quad (1)$$

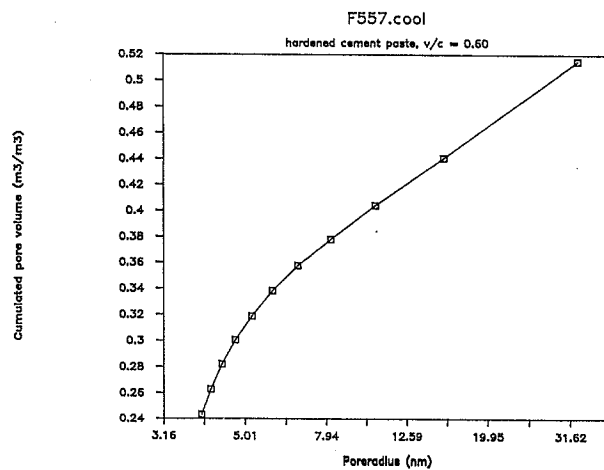




Plot of non frozen amount of water w_{nf} versus freezing point depression ΔT .



Program PORESIZE.



Plot of cumulated pore volume versus pore radius.

Examples of the type above are shown in appendixes 2 and 3.

Input

Input of the program PORESIZE is mainly found from the program IS1988. Input of the program IS1988 is found from the results of a run with the SETARAM low temperature calorimeter at Building Materials Laboratory, the Technical University of Denmark. From the program IS1988 the INCREMENT method is used only. The COOL INCREMENT and HEAT INCREMENT methods give different poresize distributions. Knowledge of the dry density of the sample is also needed.

Output from the program IS1988 consists of (normally about five) corresponding values of freezing point depression ΔT and freezable amount of water w_f . Calculate the values of non freezable amount of water w_{nf} using the formula

$$w_{nf}(\Delta T) = w_{es} - w_f(\Delta T) \quad (\text{g/g dry}) \quad (1)$$

w_{es} is the total evaporable amount of water, which has to be known.

Now you have (normally about five) corresponding values of w_{nf} and ΔT . For example, microcalorimeter runs F557.COOL and F557.HEAT give the results shown in table 1 below.

Table 1 _____ Microcalorimeter run F557 _____

ΔT (°C)	-3	-10	-20	-35	-55
$w_{nf}(\text{cool})$ (g/g dry)	0.407	0.334	0.298	0.261	0.214
$w_{nf}(\text{heat})$ (g/g dry)	0.407	0.250	0.224	0.210	0.205

These values are plotted in a graph of the type shown in appendix 2:5. From this graph you can get any number of corresponding values of w_{nf} and ΔT you want. These pairs of values are used in the program PORESIZE. In this report the values $\Delta T = 4, 9, 14, 19, 24 \dots$ are chosen. The corresponding values of w_{nf} you get from the graph or they can be calculated by linear regression. (These things can be done by computer, but no program is yet written.)

Starting PORESIZE and entering values

In the following underlined words are to be typed. <> means that the return-key is to be pressed. Words written in fat style are visible on the screen. Note that starting SYMPHONY can be somewhat different with different computers.

Turn the computer on and insert disk with program PORESIZE.

C:\>cd symphony <>

C:\SYMPHONY>access <>

Select **SYMPHONY** in menu.

Please wait...Loading symphony

Press key F9. Select **File** in menu. Select **Retrive** in menu. Press Esc-key twice until **Save file name:** is visible. Type a:poresize <>.

Wait is flushing in the upper right corner of the screen. After a while the working sheet shows up. The three first rows (row numbers 1 to 3) are empty. Here you can write e.g. test number, sample number and/or sample descriptions.

Enter value of dry density ρ_d (kg/m³) in cell A5, e.g. 1300 <>.

Enter value of ΔT (°C) in cells C5 to C(max)25. Enter corresponding values of w_{nf} (g H₂O/g dry material) in cells D5 to D(max)25. Values of ΔT and w_{nf} you get from a graph of the type shown in appendix 2:5. (An example of this kind of values are also shown in appendix 2:4, page 2.)

Figure 1 below shows an example of a PORESIZE working sheet.

	input ↓		input ↓					
	A	B	C	D	E	F	G	H
1	Test number F557							
2	Cool							
3								
4	ro(d)	index	DT	Wnf	ro(w)	DH	sigma	rk
5	1300	0	4	0.396	998.96	5867.485	0.076196	3.17E-08
6		1	9	0.344	997.66	5687.335	0.076890	1.46E-08
7		2	14	0.319	996.36	5507.185	0.077582	9.68E-09
8		3	19	0.3015	995.06	5327.035	0.078273	7.38E-09
9		4	24	0.288	993.76	5146.885	0.078962	6.05E-09
10		5	29	0.2755	992.46	4966.735	0.079650	5.19E-09
11		6	34	0.263	991.16	4786.585	0.080337	4.59E-09
12		7	39	0.2515	989.86	4606.435	0.081021	4.16E-09
13		8	44	0.24	988.56	4426.285	0.081705	3.83E-09
14		9	49	0.228	987.26	4246.135	0.082387	3.58E-09
15		10	54	0.216	985.96	4065.985	0.083067	3.39E-09

Figure 1. Example of PORESIZE working sheet.

If you want to enter more than 21 values you first have to do the following:

Point at cell B25. Press F10. Select **Copy** from menu.

Range to copy FROM: B25..U25 <>

(Either write B25..U25 or mark by right arrow-key.)

Range to copy TO: B26..Bxx <>

xx is the chosen total number of values plus 4.

Results are automatically presented in columns E to U. The columns which are plotted in the graph are column T (y-axis, cumulated pore volume in m^3/m^3) and column U (x-axis, pore radius in nm).

Symbols, formulas, units and other explanations of the different columns are presented in appendix 4 Column heads. (Note! Values are always wrong when rownumber > max rownumber in columns C and D. The last value not equal to zero in column Q ($(w_{nf})_{n-1} + (w_{nf})_n$) is also always wrong. This depends on the function of the formulas in the program.)

Graphical presentation

To get a graphical presentation of the results, press key F10 and select item written below in fat style from menu.

Graph 1st-Settings Type XY Range

X

Mark column U (pore radius in nm) by marking cell U5, pressing the tab-key and down-key until all cells with values are marked. Press <return>.

A

Do the same as stated above with column T (cumulated pore volume in m^3/m^3).

Quit Switch Titles First

Type e.g. F557.cool <>

Second

Type e.g. hardened cement paste, v/c=0.60 <>

X-axis

Type Poreradius (nm) <>

Y-axis

Type Cumulated pore volume (m^3/m^3) <>

The presentation of the results often becomes more clear if the scale of the x-axis is logarithmic.

Quit X-scale Type Logarithmic Format Fixed

Number of decimal places (0..15):2 <>

Quit Quit Preview

To leave the picture, press any key. Change disk. Save picture by **Image-save**.

Filename: F557 <> (e.g.)

The file is automatically saved as F557.pic.

Printing and plotting results

Note that printing and plotting can be somewhat different with different computers.

Print sheet with values by pressing F9 and selecting items written below in fat style. (First check printer and communication between computer and printer.)

Print Settings Source Range

Range to be printed: A1..U15 <> (e.g.)

Quit Go

Plot graph by pressing F9 and selecting items written below in fat style. (First check plotter (load paper and pen) and communication between computer and plotter.)

Exit Yes PrintGraph Settings Hardware Graphs-Directory

Enter directory containing picture files: A: or B: <> depending on in which drive disk with graph-file is inserted.

Image-Select

Go to file to be plotted with up or down keys. (Mark file with space-key.) Press <return>.

Go

References

- [1] Villadsen, J. Kielsgaard Hansen, K. Brugerdokumentation til ismængdeberegningsprogrammet IS1988. (*User Instructions to IS1988.*) In Danish. Building Materials Laboratory, Department of Civil Engineering, the Technical University of Denmark. Teknisk Rapport 234/91.
- [2] Dalsgård Holland, A. Villadsen, J. Nielsen, A.M. Kielsgaard Hansen, K. Betjeningsvejledning til mikrokalorimeter, Version KL3. (*User Instructions to Microcalorimeter.*) In Danish. Building Materials Laboratory, Department of Civil Engineering, the Technical University of Denmark. Teknisk rapport 230/91.
- [3] Villadsen, J. Handwritten material and personal communication.
- [4] Fagerlund, G. Determination of pore-size distribution from freezing point depression, *Materiaux et Constructions*, vol. 6, no. 33, 1973.

PORESTØRRELSERES FORDELINGSKURVEN
 FORLØB I DET FINPORØSE OMRÅDE
 BESTEMT V.H.A. MIKROKALORIMETRI
 KØRSELSNR. $S_d = \frac{\text{kg}}{\text{m}^3}$

$$(\Delta V_p)_n = \left[A \times \frac{1}{S_n} - 4 \times B \times C \right] \times D$$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Index n		ΔT	$w_{nf}(\Delta T)$	$\rho_w(\Delta T)$	$\Delta H(\Delta T)$	$\sigma_{Lg}(\Delta T)$	r_K	$z(\Delta T)$	r	$\frac{(\Delta V_p)_n}{r_{n-1} + r_n}$	$\sum_{i=0}^{n-1} \frac{(\Delta V_p)_i}{r_{i-1} + r_i}$	$t_{n-1} - t_n$	$\frac{(r_{n-1} + r_n)^2}{(r_{i-1} + r_i)(r_n)} \left(w_{nf,n-1} - (w_{nf})_n \right)$	$(w_{nf,n-1} - (w_{nf})_n) \frac{g \text{ H}_2\text{O}}{g \text{ tør}}$	$(\Delta V_p)_n$	$(\sum \Delta V_p)_n$	$S_d(\sum \Delta V_p)_n$
—		K	$\frac{g \text{ H}_2\text{O}}{g \text{ tør}}$	$\frac{\text{kg}}{\text{m}^3}$	$\frac{\text{J}}{\text{mol} \cdot \text{K}}$	$\frac{\text{N}}{\text{m}}$	10^{-9} m	10^{-9} m	10^{-9} m	$\frac{\text{m}^2}{\text{kg tør}}$	$\frac{\text{m}^2}{\text{kg tør}}$	10^{-9} m	—	$\frac{g \text{ H}_2\text{O}}{g \text{ tør}}$	$\frac{\text{m}^3}{\text{kg tør}}$	$\frac{\text{m}^3}{\text{kg tør}}$	$\frac{\text{m}^3}{\text{m}^3}$
0											C	B	D	A			
1											0						
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Example: Calorimeter test F557.cool and F557.heat

(These are the same calorimeter tests as the example in the manual of the program IS1988.)

Sample description: Virgin cement paste.

2:1 Output from calorimeter test F557.cool.

2:2 Graph C_p nominal versus temperature. F557.cool.

2:3 Output from calorimeter run F557.heat.

2:4 Output from IS1988 and calculation of w_{nf} versus ΔT .

2:5 Graph w_{nf} versus ΔT .

2:6 Computer calculations with program PORESIZE. F557.cool.

2:7 Computer calculations with program PORESIZE. F557.heat.

2:8 Graph made by PORESIZE: Cumulated pore volume versus pore radius. F557.cool.

2:9 Graph made by PORESIZE: Cumulated pore volume versus pore radius. F557.heat.

2:10 Graph made by EXCEL: Cumulated pore volume versus pore radius. F557.cool and F557.heat.

L B M Laboratoriet for bygningsmaterialer. Danmarks tekniske højskole.

Building materials laboratory. The technical university of Denmark.

TEST NO. F557 COOL

11.JAN.1988

sample no. :0
sample weight : 6.6250 gram
sample description :
Jomfruelig, AgI = 0.00271g.

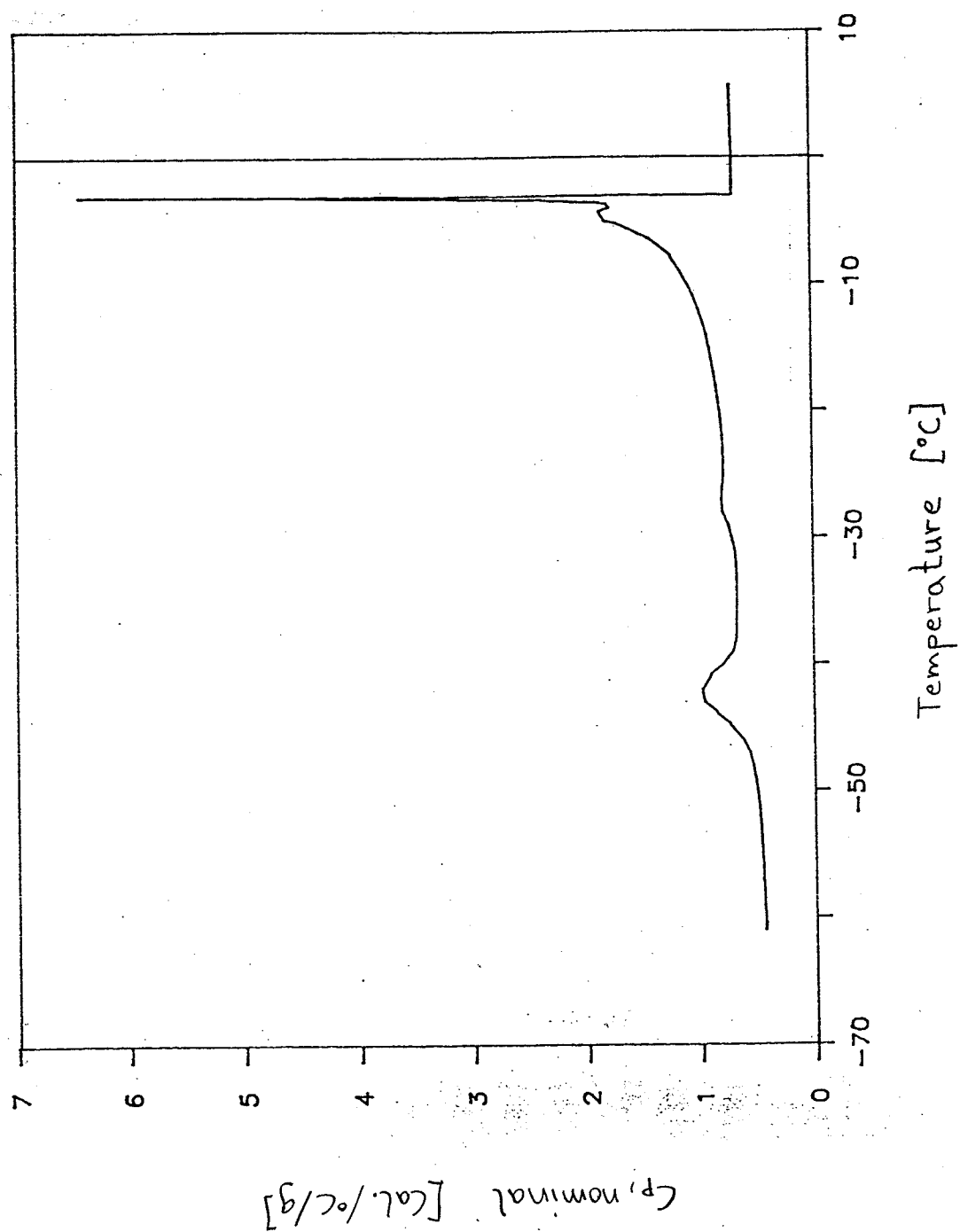
start time :162043

t	ts	tc	Ei	Dq/Dt	App. Heat Capacity nominal	Capacity true	Integrated	Dt/Dt
Time	Lab/sek	Deg.C	Myvolt	Mcal/sec/g	Cal/deg/g	cal/g	Mdeg/sec	
162057	12	5.71	704	0.4302	-0.4453	0.1093	0.005	3.935
162108	23	5.76	705	0.4308	-0.4459	0.0945	0.010	4.559
162113	28	5.71	707	0.4320	-0.4472	-0.0437	0.012	-9.884
162227	102	5.66	706	0.4314	-0.4466	-0.6576	0.044	-0.656
162419	214	5.57	705	0.4308	-0.4460	-0.4941	0.092	-0.872
162644	360	5.37	702	0.4290	-0.4441	-0.3191	0.155	-1.344
162851	486	5.27	704	0.4303	-0.4454	-0.5578	0.209	-0.771
163107	623	5.03	705	0.4309	-0.4461	-0.2410	0.268	-1.788
164714	1590	4.05	701	0.4287	-0.4438	-0.4245	0.683	-1.010
170538	2693	3.03	697	0.4265	-0.4415	-0.4589	1.153	-0.929
172244	3720	2.05	695	0.4255	-0.4405	-0.4473	1.590	-0.951
174012	4768	1.03	692	0.4240	-0.4389	-0.4335	2.034	-0.978
175741	5816	0.05	689	0.4224	-0.4372	-0.4533	2.477	-0.932
175914	5909	-0.05	691	0.4236	-0.4385	-0.4037	2.517	-1.050
175915	5910	0.05	691	0.4236	-0.4385	0.0059	2.517	71.282
175921	5917	-0.05	689	0.4224	-0.4373	-0.0273	2.520	-15.452
175923	5918	0.05	691	0.4236	-0.4385	0.0066	2.521	63.828
175935	5930	-0.05	689	0.4224	-0.4373	-0.0509	2.525	-8.304
175937	5932	0.05	690	0.4230	-0.4379	0.0085	2.526	49.572
175938	5933	-0.05	691	0.4236	-0.4385	-0.0052	2.527	-80.708
175938	5934	0.05	691	0.4236	-0.4385	0.0031	2.527	135.634
175941	5937	-0.05	689	0.4224	-0.4373	-0.0119	2.528	-35.641
175945	5940	0.05	693	0.4248	-0.4398	0.0158	2.530	26.903
175948	5943	-0.05	690	0.4230	-0.4379	-0.0138	2.531	-30.710
175950	5946	0.05	692	0.4242	-0.4392	0.0093	2.532	45.422
175951	5947	-0.05	692	0.4242	-0.4392	-0.0043	2.532	-99.649
175952	5948	0.05	690	0.4230	-0.4379	0.0050	2.533	84.186
175954	5949	-0.05	691	0.4236	-0.4385	-0.0064	2.534	-65.984
175955	5950	0.05	691	0.4236	-0.4385	0.0033	2.534	126.826
175955	5951	-0.05	692	0.4242	-0.4392	-0.0040	2.534	-105.007
175958	5953	0.05	690	0.4230	-0.4379	0.0093	2.535	45.422
175959	5954	-0.05	690	0.4230	-0.4379	-0.0050	2.536	-84.918
180009	5965	0.05	692	0.4242	-0.4392	0.0454	2.540	9.354
180012	5967	-0.05	690	0.4230	-0.4379	-0.0102	2.541	-41.380
181634	6949	-1.03	691	0.4239	-0.4388	-0.4264	2.958	-0.994
183340	7975	-2.00	690	0.4235	-0.4385	-0.4449	3.392	-0.952
185101	9017	-3.03	689	0.4232	-0.4381	-0.4299	3.833	-0.984
185218	9093	-2.98	808	0.4963	-0.5138	0.7749	3.871	0.640
185219	9095	-2.98	1079	0.6628	-0.6861	0.0000	3.872	0.000
185220	9095	-3.03	1345	0.8262	-0.8552	-0.0139	3.872	-59.546
185221	9096	-2.98	1604	0.9852	-1.0199	0.0155	3.873	63.413
185221	9097	-3.03	1883	1.1566	-1.1973	-0.0144	3.874	-80.046
185222	9097	-3.03	2168	1.3317	-1.3786	0.0000	3.875	0.000

185225	9100	-3.08	3312	2.0345	-2.1061	-0.0254	3.880	-80.046
185226	9101	-3.03	3511	2.1566	-2.2325	0.0265	3.881	81.380
185226	9102	-2.98	3698	2.2714	-2.3514	0.0279	3.883	81.380
185227	9102	-2.98	3816	2.3439	-2.4264	0.0000	3.884	0.000
185227	9103	-3.03	3988	2.4496	-2.5358	-0.0301	3.886	-81.380
185228	9104	-3.03	4259	2.6161	-2.7082	0.0000	3.888	0.000
185229	9105	-3.08	4518	2.7753	-2.8730	-0.0563	3.891	-49.321
185230	9106	-3.03	4717	2.8974	-2.9994	0.0522	3.894	55.487
185231	9107	-3.03	4905	3.0129	-3.1189	0.0000	3.896	0.000
185232	9107	-3.03	5084	3.1228	-3.2328	0.0000	3.899	0.000
185233	9108	-3.03	5292	3.2506	-3.3650	0.0000	3.902	0.000
185234	9110	-3.03	5515	3.3876	-3.5068	0.0000	3.907	0.000
185236	9111	-3.08	5712	3.5087	-3.6322	-0.0826	3.911	-42.459
185237	9112	-3.03	5905	3.6271	-3.7548	0.1107	3.916	32.771
185239	9114	-3.03	6084	3.7371	-3.8686	0.0000	3.923	0.000
185241	9117	-3.03	6260	3.8452	-3.9805	0.0000	3.932	0.000
185246	9121	-3.03	6432	3.9509	-4.0899	0.0000	3.950	0.000
185258	9134	-2.98	6261	3.8457	-3.9810	0.9821	3.998	3.916
185304	9139	-3.03	6087	3.7389	-3.8705	-0.4288	4.019	-8.719
185309	9144	-3.03	5914	3.6327	-3.7605	0.0000	4.038	0.000
185315	9150	-3.03	5742	3.5270	-3.6512	0.0000	4.058	0.000
185320	9156	-3.08	5571	3.4221	-3.5425	-0.4079	4.078	-8.390
185327	9162	-3.08	5401	3.3177	-3.4344	0.0000	4.098	0.000
185334	9169	-3.08	5227	3.2108	-3.3238	0.0000	4.120	0.000
185341	9176	-3.08	5055	3.1051	-3.2144	0.0000	4.143	0.000
185349	9184	-3.13	4882	2.9990	-3.1045	-0.5024	4.167	-5.969
185354	9190	-3.03	4782	2.9373	-3.0407	0.1537	4.182	19.111
185403	9199	-3.08	4611	2.8324	-2.9321	-0.5354	4.209	-5.290
185410	9206	-3.13	4498	2.7631	-2.8603	-0.3791	4.227	-7.288
185416	9212	-3.13	4396	2.7004	-2.7955	0.0000	4.244	0.000
185423	9219	-3.13	4296	2.6390	-2.7319	0.0000	4.262	0.000
185430	9225	-3.17	4196	2.5776	-2.6684	-0.3627	4.280	-7.107
185437	9233	-3.13	4097	2.5167	-2.6053	0.3763	4.298	6.689
185445	9241	-3.17	3996	2.4548	-2.5412	-0.4007	4.318	-6.126
185454	9249	-3.17	3896	2.3934	-2.4776	0.0000	4.338	0.000
185503	9258	-3.17	3794	2.3307	-2.4127	0.0000	4.359	0.000
185513	9268	-3.17	3692	2.2680	-2.3479	0.0000	4.381	0.000
185523	9278	-3.22	3592	2.2067	-2.2843	-0.4646	4.404	-4.750
185534	9289	-3.17	3491	2.1446	-2.2200	0.4919	4.428	4.360
185546	9302	-3.17	3391	2.0831	-2.1564	0.0000	4.453	0.000
185558	9314	-3.17	3289	2.0205	-2.0916	0.0000	4.478	0.000
185613	9328	-3.22	3188	1.9585	-2.0274	-0.5684	4.506	-3.446
185628	9343	-3.27	3088	1.8971	-1.9639	-0.5847	4.534	-3.244
185644	9360	-3.27	2987	1.8351	-1.8997	0.0000	4.565	0.000
185701	9377	-3.27	2887	1.7736	-1.8361	0.0000	4.595	0.000
185720	9396	-3.27	2786	1.7116	-1.7718	0.0000	4.628	0.000
185741	9416	-3.32	2686	1.6502	-1.7083	-0.6979	4.662	-2.365
185804	9439	-3.37	2587	1.5894	-1.6454	-0.7490	4.698	-2.122
185830	9466	-3.37	2487	1.5280	-1.5818	0.0000	4.739	0.000
185900	9495	-3.37	2387	1.4666	-1.5182	0.0000	4.781	0.000
185934	9529	-3.47	2287	1.4052	-1.4547	-0.4892	4.829	-2.872
190011	9567	-3.47	2188	1.3444	-1.3917	0.0000	4.879	0.000
190053	9609	-3.52	2088	1.2830	-1.3281	-1.1128	4.934	-1.153
190144	9660	-3.56	1988	1.2216	-1.2646	-1.2739	4.996	-0.959
190255	9730	-3.56	1888	1.1601	-1.2010	0.0000	5.078	0.000
190440	9835	-3.71	1788	1.0988	-1.1375	-0.7902	5.193	-1.390
190828	10063	-4.00	1764	1.0843	-1.1224	-0.8434	5.440	-1.286
191437	10433	-4.30	1864	1.1459	-1.1863	-1.4450	5.864	-0.793
192552	11107	-5.03	1810	1.1133	-1.1525	-1.0249	6.614	-1.086
193122	11437	-5.22	1710	1.0519	-1.0890	-1.7791	6.962	-0.591
193706	11781	-5.62	1610	0.9907	-1.0256	-0.8722	7.303	-1.136
194303	12138	-6.01	1523	0.9374	-0.9704	-0.8572	7.637	-1.094
195057	12612	-6.40	1423	0.8761	-0.9070	-1.0631	8.053	-0.824
200108	13223	-7.03	1330	0.8192	-0.8481	-0.7882	8.553	-1.039
201549	14104	-7.76	1229	0.7574	-0.7841	-0.9110	9.220	-0.831

211044	17400	-11.04	1031	0.6370	-0.6594	-0.6641	11.445	-0.959
212800	18435	-12.01	989	0.6115	-0.6331	-0.6485	12.078	-0.943
214540	19496	-13.04	951	0.5885	-0.6093	-0.6087	12.702	-0.967
220235	20510	-14.01	922	0.5711	-0.5912	-0.5930	13.282	-0.963
222026	21581	-15.04	899	0.5573	-0.5769	-0.5822	13.878	-0.957
223716	22592	-16.02	877	0.5441	-0.5633	-0.5629	14.428	-0.967
225518	23674	-17.04	859	0.5334	-0.5522	-0.5629	15.005	-0.948
231146	24661	-18.02	844	0.5246	-0.5430	-0.5305	15.524	-0.989
232952	25747	-19.04	828	0.5151	-0.5333	-0.5455	16.083	-0.944
234646	26762	-20.02	813	0.5063	-0.5241	-0.5259	16.596	-0.963
528	27883	-21.04	799	0.4980	-0.5155	-0.5448	17.155	-0.914
2207	28883	-22.02	791	0.4935	-0.5109	-0.5049	17.648	-0.978
4004	29959	-23.05	787	0.4915	-0.5088	-0.5162	18.177	-0.952
5632	30948	-24.02	784	0.4901	-0.5074	-0.4960	18.662	-0.988
11344	31980	-25.00	783	0.4900	-0.5072	-0.5178	19.167	-0.946
13133	33048	-26.03	801	0.5018	-0.5194	-0.5229	19.704	-0.960
14832	34067	-27.00	809	0.5073	-0.5251	-0.5294	20.221	-0.958
20547	35103	-28.03	794	0.4984	-0.5160	-0.5032	20.737	-0.990
22245	36120	-29.00	745	0.4682	-0.4846	-0.4880	21.213	-0.959
24025	37180	-30.03	715	0.4498	-0.4657	-0.4648	21.690	-0.968
25713	38189	-31.01	691	0.4352	-0.4505	-0.4494	22.129	-0.968
31414	39210	-32.03	682	0.4300	-0.4452	-0.4283	22.568	-1.004
33136	40251	-33.01	675	0.4261	-0.4411	-0.4545	23.012	-0.938
34918	41314	-34.03	675	0.4266	-0.4416	-0.4420	23.465	-0.965
40544	42299	-35.01	678	0.4290	-0.4441	-0.4330	23.888	-0.991
42333	43368	-36.04	681	0.4314	-0.4466	-0.4497	24.349	-0.959
44022	44378	-37.01	684	0.4339	-0.4491	-0.4485	24.787	-0.967
45749	45425	-38.04	689	0.4376	-0.4530	-0.4469	25.245	-0.979
51438	46434	-39.01	717	0.4559	-0.4720	-0.4710	25.705	-0.968
53209	47485	-40.04	805	0.5126	-0.5306	-0.5253	26.244	-0.976
54605	48320	-40.77	905	0.5768	-0.5971	-0.6581	26.726	-0.876
54827	48462	-41.02	918	0.5852	-0.6058	-0.3394	26.809	-1.724
60605	49521	-42.04	988	0.6307	-0.6529	-0.6511	27.476	-0.969
62231	50507	-43.02	961	0.6143	-0.6359	-0.6204	28.082	-0.990
63709	51385	-43.75	862	0.5515	-0.5709	-0.6610	28.566	-0.834
63949	51544	-44.04	845	0.5409	-0.5599	-0.2950	28.653	-1.834
65212	52287	-44.68	746	0.4779	-0.4947	-0.5592	29.008	-0.855
65633	52549	-45.02	721	0.4621	-0.4784	-0.3535	29.128	-1.307
71409	53604	-46.04	628	0.4031	-0.4173	-0.4150	29.554	-0.971
73046	54602	-47.02	575	0.3696	-0.3826	-0.3775	29.923	-0.979
74756	55631	-48.05	545	0.3508	-0.3631	-0.3521	30.284	-0.996
80428	56624	-49.02	526	0.3390	-0.3510	-0.3446	30.620	-0.984
82059	57615	-50.00	510	0.3292	-0.3408	-0.3341	30.946	-0.985
83831	58666	-51.03	499	0.3226	-0.3339	-0.3308	31.286	-0.975
85458	59654	-52.00	489	0.3166	-0.3277	-0.3200	31.598	-0.989
91233	60708	-53.03	482	0.3125	-0.3235	-0.3215	31.928	-0.972
92833	61668	-54.00	478	0.3104	-0.3213	-0.3052	32.226	-1.017
94530	62685	-55.03	472	0.3070	-0.3178	-0.3044	32.538	-1.008
100213	63689	-56.01	467	0.3042	-0.3149	-0.3126	32.843	-0.973
101930	64726	-57.03	464	0.3027	-0.3134	-0.3062	33.157	-0.989
103549	65704	-58.01	458	0.2993	-0.3098	-0.2999	33.450	-0.998
105258	66734	-59.03	456	0.2985	-0.3090	-0.2997	33.757	-0.996
110921	67717	-60.01	451	0.2957	-0.3061	-0.2976	34.048	-0.994
112620	68736	-61.04	449	0.2949	-0.3053	-0.2930	34.348	-1.006

F557.cool



L B M Laboratoriet for bygningsmaterialer. Danmarks tekniske højskole.

Building materials laboratory. The technical university of Denmark.

TEST NO. F557 HEAT

12.JAN.1988

sample no. :0
 sample weight : 6.6250 gram
 sample description :
 Jomfruelig, AgI = 0.00271g.

start time :114336

t	ts	tc	Ei	Dq/Dt	App. Heat Capacity nominal	Integrated true	Dt/Dt
Time	Lab/sek	Deg.C	Myvolt	Mcal/sec/g	Cal/deg/g	cal/g	Mdeg/sec
114338	0	-61.33	235	0.1544	0.1396	0.0005	0.000 305.176
114344	6	-61.33	225	0.1478	0.1337	0.0000	0.001 0.000
114451	73	-61.23	125	0.0821	0.0742	0.0561	0.006 1.463
114553	135	-61.13	25	0.0164	0.0148	0.0105	0.007 1.564
114609	151	-61.04	0	0.0000	0.0000	0.0000	0.007 6.006
114713	215	-60.94	-101	-0.0663	-0.0600	-0.0431	0.003 1.538
114717	219	-61.04	-105	-0.0690	-0.0623	0.0032	0.003 -21.653
114824	286	-60.84	-205	-0.1346	-0.1217	-0.0460	-0.006 2.927
114941	363	-60.69	-305	-0.2002	-0.1810	-0.1050	-0.022 1.906
115111	454	-60.55	-405	-0.2658	-0.2403	-0.1644	-0.046 1.616
115308	570	-60.40	-504	-0.3306	-0.2990	-0.2626	-0.084 1.259
115545	727	-60.06	-593	-0.3888	-0.3516	-0.1790	-0.145 2.172
120358	1220	-59.38	-692	-0.4532	-0.4098	-0.3267	-0.369 1.387
120641	1383	-59.03	-692	-0.4530	-0.4096	-0.2161	-0.442 2.096
121743	2045	-58.06	-668	-0.4366	-0.3947	-0.2958	-0.731 1.476
122948	2770	-57.03	-637	-0.4156	-0.3758	-0.2942	-1.033 1.413
124216	3518	-56.05	-608	-0.3961	-0.3581	-0.3032	-1.329 1.306
125518	4300	-55.03	-585	-0.3805	-0.3440	-0.2901	-1.626 1.311
130841	5103	-54.05	-567	-0.3682	-0.3329	-0.3029	-1.922 1.216
132303	5966	-53.03	-553	-0.3586	-0.3242	-0.3016	-2.231 1.189
133702	6804	-52.05	-550	-0.3561	-0.3220	-0.3057	-2.530 1.165
135204	7706	-51.03	-543	-0.3510	-0.3174	-0.3089	-2.847 1.137
140625	8567	-50.05	-543	-0.3505	-0.3169	-0.3089	-3.148 1.135
142157	9500	-49.02	-541	-0.3487	-0.3153	-0.3173	-3.474 1.099
143631	10373	-48.05	-544	-0.3502	-0.3166	-0.3131	-3.779 1.118
145158	11300	-47.02	-544	-0.3496	-0.3161	-0.3163	-4.104 1.105
150657	12199	-46.04	-549	-0.3524	-0.3186	-0.3244	-4.421 1.086
152148	13091	-45.02	-552	-0.3538	-0.3199	-0.3075	-4.736 1.151
153637	13979	-44.04	-563	-0.3604	-0.3258	-0.3279	-5.056 1.099
155136	14879	-43.02	-574	-0.3669	-0.3317	-0.3218	-5.386 1.140
160559	15741	-42.04	-584	-0.3728	-0.3371	-0.3292	-5.708 1.132
162106	16648	-41.02	-593	-0.3780	-0.3418	-0.3343	-6.050 1.131
163548	17531	-40.04	-600	-0.3820	-0.3454	-0.3453	-6.388 1.106
165038	18420	-39.01	-607	-0.3860	-0.3490	-0.3347	-6.731 1.153
170435	19257	-38.04	-612	-0.3887	-0.3514	-0.3332	-7.056 1.167
172011	20193	-37.01	-617	-0.3914	-0.3538	-0.3571	-7.422 1.096
173428	21050	-36.04	-625	-0.3960	-0.3580	-0.3476	-7.762 1.139
174851	21914	-35.06	-630	-0.3987	-0.3604	-0.3525	-8.106 1.131
180357	22819	-34.03	-637	-0.4026	-0.3640	-0.3554	-8.471 1.133
181825	23687	-33.06	-642	-0.4053	-0.3664	-0.3605	-8.823 1.124
183321	24583	-32.03	-650	-0.4099	-0.3706	-0.3581	-9.190 1.145
184814	25476	-31.05	-656	-0.4132	-0.3736	-0.3779	-9.559 1.093
190332	26394	-30.03	-664	-0.4177	-0.3777	-0.3739	-9.942 1.117

200324	29986	-26.03	-700	-0.4385	-0.3965	-0.3967	-11.488	1.105
201802	30864	-25.05	-707	-0.4424	-0.4000	-0.3981	-11.877	1.111
203326	31788	-24.02	-721	-0.4507	-0.4075	-0.4060	-12.293	1.110
204822	32684	-23.05	-732	-0.4572	-0.4133	-0.4193	-12.702	1.090
210347	33609	-22.02	-747	-0.4660	-0.4214	-0.4207	-13.134	1.108
211839	34502	-21.04	-764	-0.4762	-0.4306	-0.4351	-13.559	1.094
213342	35404	-20.02	-777	-0.4838	-0.4375	-0.4258	-13.995	1.136
214826	36288	-19.04	-796	-0.4952	-0.4478	-0.4483	-14.433	1.105
220353	37215	-18.02	-817	-0.5078	-0.4591	-0.4593	-14.904	1.106
221840	38102	-17.04	-835	-0.5185	-0.4688	-0.4706	-15.364	1.102
223403	39026	-16.02	-859	-0.5330	-0.4819	-0.4801	-15.856	1.110
224849	39911	-15.04	-883	-0.5474	-0.4949	-0.4963	-16.341	1.103
230402	40825	-14.01	-911	-0.5642	-0.5102	-0.5027	-16.856	1.122
231845	41707	-13.04	-943	-0.5836	-0.5277	-0.5273	-17.371	1.107
233429	42651	-12.01	-978	-0.6047	-0.5468	-0.5568	-17.942	1.086
234852	43514	-11.04	-1016	-0.6277	-0.5676	-0.5550	-18.484	1.131
312	44374	-10.06	-1060	-0.6544	-0.5917	-0.5761	-19.047	1.136
1855	45317	-9.03	-1116	-0.6885	-0.6225	-0.6332	-19.696	1.087
3329	46191	-8.06	-1173	-0.7231	-0.6538	-0.6472	-20.328	1.117
4901	47123	-7.03	-1250	-0.7700	-0.6962	-0.6999	-21.045	1.100
10357	48019	-6.05	-1341	-0.8254	-0.7463	-0.7570	-21.785	1.090
11625	48767	-5.27	-1440	-0.8859	-0.8010	-0.8482	-22.447	1.044
11902	48924	-5.03	-1459	-0.8974	-0.8114	-0.5768	-22.588	1.556
12912	49534	-4.39	-1559	-0.9585	-0.8666	-0.9211	-23.173	1.041
13344	49806	-4.05	-1607	-0.9878	-0.8931	-0.7873	-23.442	1.255
14134	50276	-3.61	-1707	-1.0489	-0.9484	-1.1210	-23.935	0.936
14818	50680	-3.17	-1807	-1.1101	-1.0037	-1.0211	-24.383	1.087
14909	50731	-3.03	-1816	-1.1155	-1.0086	-0.3849	-24.440	2.898
15447	51069	-2.69	-1915	-1.1760	-1.0633	-1.1632	-24.837	1.011
15952	51374	-2.39	-2014	-1.2366	-1.1181	-1.2890	-25.215	0.959
20353	51616	-2.05	-2100	-1.2891	-1.1655	-0.9104	-25.526	1.416
20752	51854	-1.86	-2200	-1.3503	-1.2209	-1.6469	-25.848	0.820
21134	52076	-1.61	-2300	-1.4115	-1.2762	-1.2848	-26.161	1.099
21453	52275	-1.37	-2400	-1.4726	-1.3315	-1.2023	-26.455	1.225
21757	52459	-1.17	-2501	-1.5344	-1.3873	-1.4417	-26.737	1.064
21913	52535	-1.03	-2542	-1.5594	-1.4099	-0.8133	-26.856	1.917
22158	52700	-0.93	-2642	-1.6206	-1.4653	-2.7409	-27.123	0.591
22431	52853	-0.83	-2742	-1.6819	-1.5207	-2.6259	-27.380	0.640
22656	52998	-0.59	-2842	-1.7429	-1.5759	-1.0356	-27.633	1.683
22912	53135	-0.44	-2942	-1.8041	-1.6312	-1.6837	-27.879	1.071
23125	53267	-0.34	-3042	-1.8653	-1.6865	-2.5284	-28.126	0.738
23326	53388	-0.15	-3142	-1.9264	-1.7418	-1.1924	-28.359	1.616
23409	53431	-0.05	-3177	-1.9477	-1.7611	-0.8622	-28.443	2.259
23542	53524	0.05	-3262	-1.9997	-1.8081	-1.8997	-28.629	1.053
23544	53526	-0.05	-3262	-1.9998	-1.8082	0.0393	-28.633	-50.863
23551	53533	0.05	-3269	-2.0040	-1.8120	-0.1510	-28.647	13.269
23553	53535	-0.05	-3269	-2.0041	-1.8121	0.0361	-28.651	-55.487
23554	53536	0.05	-3270	-2.0046	-1.8125	-0.0168	-28.652	119.093
23554	53536	-0.05	-3271	-2.0054	-1.8132	0.0158	-28.654	-126.826
23555	53537	0.05	-3274	-2.0071	-1.8147	-0.0191	-28.656	105.007
23558	53540	-0.05	-3277	-2.0090	-1.8165	0.0621	-28.662	-32.337
23602	53544	0.05	-3281	-2.0114	-1.8186	-0.0838	-28.670	23.994
23606	53548	-0.05	-3284	-2.0133	-1.8204	0.0746	-28.677	-26.977
23608	53550	0.05	-3283	-2.0126	-1.8197	-0.0398	-28.681	50.599
23624	53566	-0.05	-3300	-2.0231	-1.8292	0.3367	-28.714	-6.010
23626	53568	0.05	-3302	-2.0242	-1.8302	-0.0400	-28.718	50.599
23748	53650	0.15	-3401	-2.0848	-1.8850	-1.7448	-28.888	1.195
23750	53652	0.05	-3404	-2.0868	-1.8868	0.0504	-28.893	-41.380
23838	53700	0.20	-3504	-2.1479	-1.9420	-0.6974	-28.996	3.080
23911	53733	0.20	-3604	-2.2092	-1.9975	0.0000	-29.069	0.000
23939	53761	0.24	-3704	-2.2704	-2.0528	-1.2973	-29.132	1.750
24001	53784	0.29	-3803	-2.3310	-2.1076	-1.0751	-29.185	2.168
24020	53802	0.24	-3903	-2.3924	-2.1631	0.9201	-29.230	-2.600
24038	53820	0.24	-4002	-2.4531	-2.2180	0.0000	-29.273	0.000
24054	53836	0.29	-4103	-2.5149	-2.2739	-0.8117	-29.313	3.098

24159	53902	0.39	-4575	-2.8041	-2.5353	0.0000	-29.490	0.000
24224	53926	0.44	-4748	-2.9100	-2.6311	-1.4697	-29.562	1.980
24254	53956	0.44	-4919	-3.0148	-2.7259	0.0000	-29.653	0.000
24341	54004	0.49	-5089	-3.1189	-2.8200	-3.0028	-29.800	1.039
24550	54132	0.68	-4918	-3.0137	-2.7249	-1.9850	-30.188	1.518
24610	54152	0.63	-4748	-2.9097	-2.6308	1.1978	-30.246	-2.429
24631	54173	0.68	-4577	-2.8048	-2.5360	-1.1925	-30.304	2.352
24645	54187	0.73	-4477	-2.7434	-2.4805	-0.7900	-30.343	3.473
24701	54203	0.68	-4377	-2.6822	-2.4252	0.8663	-30.385	-3.096
24720	54222	0.73	-4277	-2.6209	-2.3697	-1.0316	-30.435	2.540
24743	54245	0.78	-4176	-2.5589	-2.3136	-1.2232	-30.495	2.092
24812	54274	0.83	-4076	-2.4975	-2.2582	-1.4721	-30.567	1.697
24849	54311	0.83	-3976	-2.4363	-2.2028	0.0000	-30.656	0.000
24943	54365	0.93	-3877	-2.3755	-2.1478	-1.3255	-30.786	1.792
25028	54410	1.03	-3823	-2.3422	-2.1178	-1.0841	-30.891	2.161
25226	54528	1.07	-3724	-2.2815	-2.0629	-5.5103	-31.161	0.414
25436	54658	1.22	-3624	-2.2201	-2.0073	-1.9604	-31.448	1.132
25552	54734	1.32	-3523	-2.1581	-1.9512	-1.6835	-31.612	1.282
25645	54788	1.32	-3422	-2.0962	-1.8953	0.0000	-31.724	0.000
25728	54830	1.42	-3322	-2.0348	-1.8398	-0.8914	-31.812	2.283
25802	54864	1.51	-3222	-1.9735	-1.7843	-0.6905	-31.879	2.858
25831	54893	1.46	-3122	-1.9123	-1.7290	1.1099	-31.933	-1.723
25856	54918	1.51	-3022	-1.8510	-1.6736	-0.9663	-31.980	1.916
25920	54942	1.51	-2923	-1.7903	-1.6187	0.0000	-32.023	0.000
25943	54965	1.61	-2823	-1.7290	-1.5633	-0.4054	-32.062	4.264
30006	54988	1.61	-2722	-1.6671	-1.5073	0.0000	-32.101	0.000
30030	55012	1.61	-2621	-1.6052	-1.4514	0.0000	-32.139	0.000
30053	55035	1.66	-2521	-1.5440	-1.3960	-0.7311	-32.175	2.112
30116	55059	1.66	-2419	-1.4815	-1.3395	0.0000	-32.210	0.000
30141	55084	1.71	-2319	-1.4202	-1.2841	-0.7286	-32.245	1.949
30207	55109	1.71	-2219	-1.3590	-1.2287	0.0000	-32.280	0.000
30234	55136	1.76	-2118	-1.2971	-1.1728	-0.7164	-32.315	1.810
30302	55164	1.76	-2018	-1.2358	-1.1174	0.0000	-32.350	0.000
30333	55195	1.86	-1918	-1.1745	-1.0620	-0.3641	-32.385	3.226
30405	55227	1.86	-1818	-1.1133	-1.0066	0.0000	-32.422	0.000
30441	55263	1.90	-1718	-1.0520	-0.9512	-0.7681	-32.460	1.370
30507	55289	2.00	-1650	-1.0103	-0.9135	-0.2654	-32.485	3.807
30549	55331	1.95	-1550	-0.9491	-0.8582	0.8146	-32.525	-1.165
30613	55355	2.05	-1495	-0.9154	-0.8277	-0.2265	-32.547	4.042
30705	55407	2.10	-1395	-0.8541	-0.7723	-0.9119	-32.592	0.937
30715	55417	2.00	-1379	-0.8444	-0.7635	0.0878	-32.600	-9.612
30814	55476	2.10	-1279	-0.7831	-0.7081	-0.4752	-32.647	1.648
30930	55552	2.25	-1179	-0.7218	-0.6526	-0.3749	-32.702	1.925
31107	55649	2.29	-1079	-0.6606	-0.5973	-1.3062	-32.766	0.506
31325	55787	2.49	-980	-0.5999	-0.5424	-0.4233	-32.848	1.417
31724	56026	2.78	-881	-0.5392	-0.4875	-0.4397	-32.977	1.226
32029	56212	3.03	-845	-0.5171	-0.4675	-0.3934	-33.073	1.314
33455	57077	4.00	-798	-0.4881	-0.4413	-0.4324	-33.495	1.129
35026	58008	5.03	-800	-0.4890	-0.4421	-0.4443	-33.951	1.101
40459	58881	6.01	-799	-0.4882	-0.4414	-0.4363	-34.377	1.119
42019	59801	7.03	-802	-0.4897	-0.4428	-0.4395	-34.828	1.114
43448	60670	8.01	-803	-0.4901	-0.4431	-0.4361	-35.254	1.124
45016	61598	9.03	-806	-0.4917	-0.4446	-0.4448	-35.710	1.106
50505	62487	10.01	-809	-0.4933	-0.4460	-0.4491	-36.148	1.098
52001	63383	11.04	-809	-0.4931	-0.4458	-0.4308	-36.590	1.144
53451	64273	12.01	-809	-0.4928	-0.4456	-0.4492	-37.029	1.097
55012	65195	13.04	-806	-0.4908	-0.4438	-0.4411	-37.481	1.113
60518	66100	14.01	-805	-0.4900	-0.4430	-0.4544	-37.925	1.078
62048	67031	15.04	-805	-0.4898	-0.4429	-0.4444	-38.380	1.102
63503	67885	16.02	-805	-0.4896	-0.4427	-0.4283	-38.799	1.143
65038	68820	17.04	-794	-0.4828	-0.4365	-0.4405	-39.250	1.096
70512	69695	18.02	-776	-0.4717	-0.4264	-0.4222	-39.663	1.117
72026	70608	19.04	-813	-0.4940	-0.4466	-0.4400	-40.114	1.123
73525	71507	20.02	-818	-0.4969	-0.4492	-0.4573	-40.560	1.087
75050	72432	21.04	-818	-0.4967	-0.4491	-0.4483	-41.020	1.108

82429	74451	22.71	-523	-0.3174	-0.2870	-1.2451	-41.923	0.255
82748	74650	22.75	-423	-0.2567	-0.2321	-1.0443	-41.974	0.246
83131	74873	22.80	-323	-0.1960	-0.1772	-0.8969	-42.018	0.219
83600	75142	22.80	-223	-0.1353	-0.1224	0.0000	-42.054	0.000
84214	75517	22.75	-123	-0.0747	-0.0675	0.5721	-42.082	-0.130
85328	76190	22.75	-24	-0.0146	-0.0132	0.0000	-42.092	0.000
91328	77390	22.75	28	0.0170	0.0154	0.0000	-42.072	0.000
93328	78590	22.66	35	0.0212	0.0192	-0.2611	-42.046	-0.081
95328	79790	22.61	31	0.0188	0.0170	-0.4625	-42.024	-0.041
101328	80990	22.61	25	0.0152	0.0137	0.0000	-42.005	0.000
103328	82191	22.56	20	0.0121	0.0110	-0.2984	-41.991	-0.041
104223	82725	22.46	20	0.0121	0.0110	-0.0665	-41.984	-0.183

Output from IS1988 and calculation of $w_{nf}(\Delta T)$

*****ISMAENGDER*****
*****FOR MIKROKALORIMETERKØRSEL NR. F557*****

			T E M P E R A T U R				
			Ta gr.C	Tx gr.C	Tb gr.C	Tc gr.C	Td gr.C
			-3	-10	-20	-35	-55
I	COOL	g/gssd	0	0.051729	0.077573	0.103790	0.136665
S	INCREMENT	g/gdry	0	0.072937	0.109379	0.146344	0.192698
M	COOL	g/gssd					0.139649
AE	TOTAL	g/gdry					0.196906
N							
G			4	-10	-20	-35	-55
D	HEAT	g/gssd	0	0.111178	0.129753	0.139932	0.143245
E	INCREMENT	g/gdry	0	0.156761	0.182952	0.197304	0.201976
R	HEAT	g/gssd					0.150155
	TOTAL	g/gdry					0.211718

$w_{es} = 0,407 \text{ g H}_2\text{O/g dry}$

Values in table 1 are calculated from formula 1.

Table 1 _____ Microcalorimeter run F557 _____

ΔT (°C)	-3	-10	-20	-35	-55
$w_{nf}(\text{cool})$ (g/g dry)	0.407	0.334	0.298	0.261	0.214
$w_{nf}(\text{heat})$ (g/g dry)	0.407	0.250	0.224	0.210	0.205

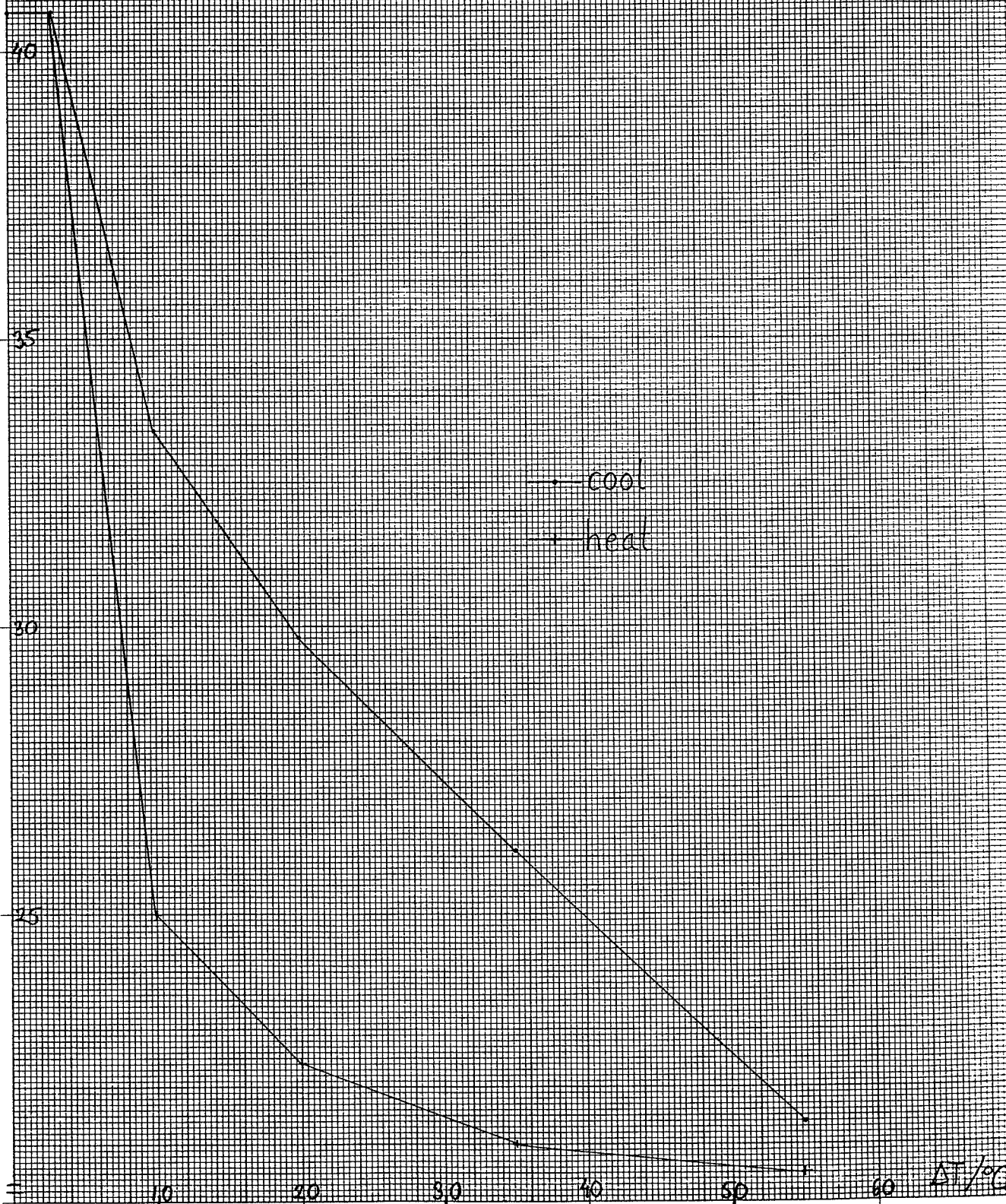
The values are plotted in a graph of the type showed in Appendix 2:5. From this graph you get a number of corresponding values of w_{nf} and ΔT (table 2). (You can also calculate the values by linear regression.)

Table 2 _____ Microcalorimeter run F557 _____

ΔT	$w_{nf}(\text{cool})$	$w_{nf}(\text{heat})$
4	0.396	0.380
9	0.344	0.2695
14	0.319	0.2392
19	0.3015	0.2265
24	0.288	0.2202
29	0.2755	0.2155
34	0.263	0.211
39	0.2515	0.209
44	0.402	0.2075
49	0.228	0.2062
54	0.216	0.205

These values (either ΔT and $w_{nf}(\text{cool})$ or ΔT and $w_{nf}(\text{heat})$), together with the dry density of the sample, are the input values to the program PORESIZE. The result output is presented in Appendixes 2:6 - 2:9.

F557.cool and F557.heat

Non frozen amount of water w_{nf} versus temperature depression ΔT . w_{nf}
gH₂O/gdry

Computer calculations with program PORESIZE.

Test number F557

Cool

ro(d)	index	DT	Wnf	ro(w)	DH	sigma	rk
1300	0	4	0.396	998.96	5867.485	0.076196	3.17E-08
	1	9	0.344	997.66	5687.335	0.076890	1.46E-08
	2	14	0.319	996.36	5507.185	0.077582	9.68E-09
	3	19	0.3015	995.06	5327.035	0.078273	7.38E-09
	4	24	0.288	993.76	5146.885	0.078962	6.05E-09
	5	29	0.2755	992.46	4966.735	0.079650	5.19E-09
	6	34	0.263	991.16	4786.585	0.080337	4.59E-09
	7	39	0.2515	989.86	4606.435	0.081021	4.16E-09
	8	44	0.24	988.56	4426.285	0.081705	3.83E-09
	9	49	0.228	987.26	4246.135	0.082387	3.58E-09
	10	54	0.216	985.96	4065.985	0.083067	3.39E-09

a	b	t	r	M	N	O	P
-1.38629	0.629960	1.24E-09	3.30E-08	1176.810		0	2.94E-10 1.096703
-2.19722	0.480749	9.47E-10	1.55E-08	1081.273	1176.810	1.30E-10	1.150782
-2.63905	0.414913	8.17E-10	1.05E-08	1077.585	2258.084	7.91E-11	1.190666
-2.94443	0.374756	7.38E-10	8.12E-09	1056.527	3335.670	5.53E-11	1.222886
-3.17805	0.346680	6.83E-10	6.73E-09	1178.499	4392.198	4.18E-11	1.249603
-3.36729	0.325487	6.41E-10	5.83E-09	1367.742	5570.697	3.31E-11	1.271891
-3.52636	0.308678	6.08E-10	5.20E-09	1409.083	6938.440	2.72E-11	1.290401
-3.66356	0.294879	5.81E-10	4.74E-09	1552.866	8347.524	2.29E-11	1.305571
-3.78418	0.283258	5.58E-10	4.39E-09	1759.383	9900.391	1.97E-11	1.317718
-3.89182	0.273275	5.38E-10	4.12E-09	1876.410	11659.77	1.72E-11	1.327088
-3.98898	0.264566	5.21E-10	3.91E-09	ERR	13536.18	ERR	ERR

Q	D(Vp)n	SD(Vp)n	T	rnm
0.052	5.71E-05	3.96E-04	0.5148	32.99070
0.025	2.81E-05	3.39E-04	0.440585	15.52002
0.0175	2.01E-05	3.11E-04	0.404010	10.49972
0.0135	1.57E-05	2.91E-04	0.377930	8.117821
0.0125	1.48E-05	2.75E-04	0.357535	6.731267
0.0125	1.51E-05	2.60E-04	0.338293	5.828359
0.0115	1.40E-05	2.45E-04	0.318687	5.197828
0.0115	1.42E-05	2.31E-04	0.300490	4.736577
0.012	1.50E-05	2.17E-04	0.282069	4.388361
0.012	1.51E-05	2.02E-04	0.262609	4.119968
0.216	ERR	1.87E-04	0.243019	3.910611

T = y-axis (cumulated pore volume in m³/m³)

rnm = x-axis (pore radius in nm)

Computer calculations with program PORESIZE.

Test number F557
Heat

ro(d)	index	DT	Wnf	ro(w)	DH	sigma	rk
1300	0	4	0.38	998.96	5867.485	0.076196	3.17E-08
	1	9	0.2695	997.66	5687.335	0.076890	1.46E-08
	2	14	0.2392	996.36	5507.185	0.077582	9.68E-09
	3	19	0.2265	995.06	5327.035	0.078273	7.38E-09
	4	24	0.2202	993.76	5146.885	0.078962	6.05E-09
	5	29	0.2155	992.46	4966.735	0.079650	5.19E-09
	6	34	0.211	991.16	4786.585	0.080337	4.59E-09
	7	39	0.209	989.86	4606.435	0.081021	4.16E-09
	8	44	0.2075	988.56	4426.285	0.081705	3.83E-09
	9	49	0.2062	987.26	4246.135	0.082387	3.58E-09
	10	54	0.205	985.96	4065.985	0.083067	3.39E-09

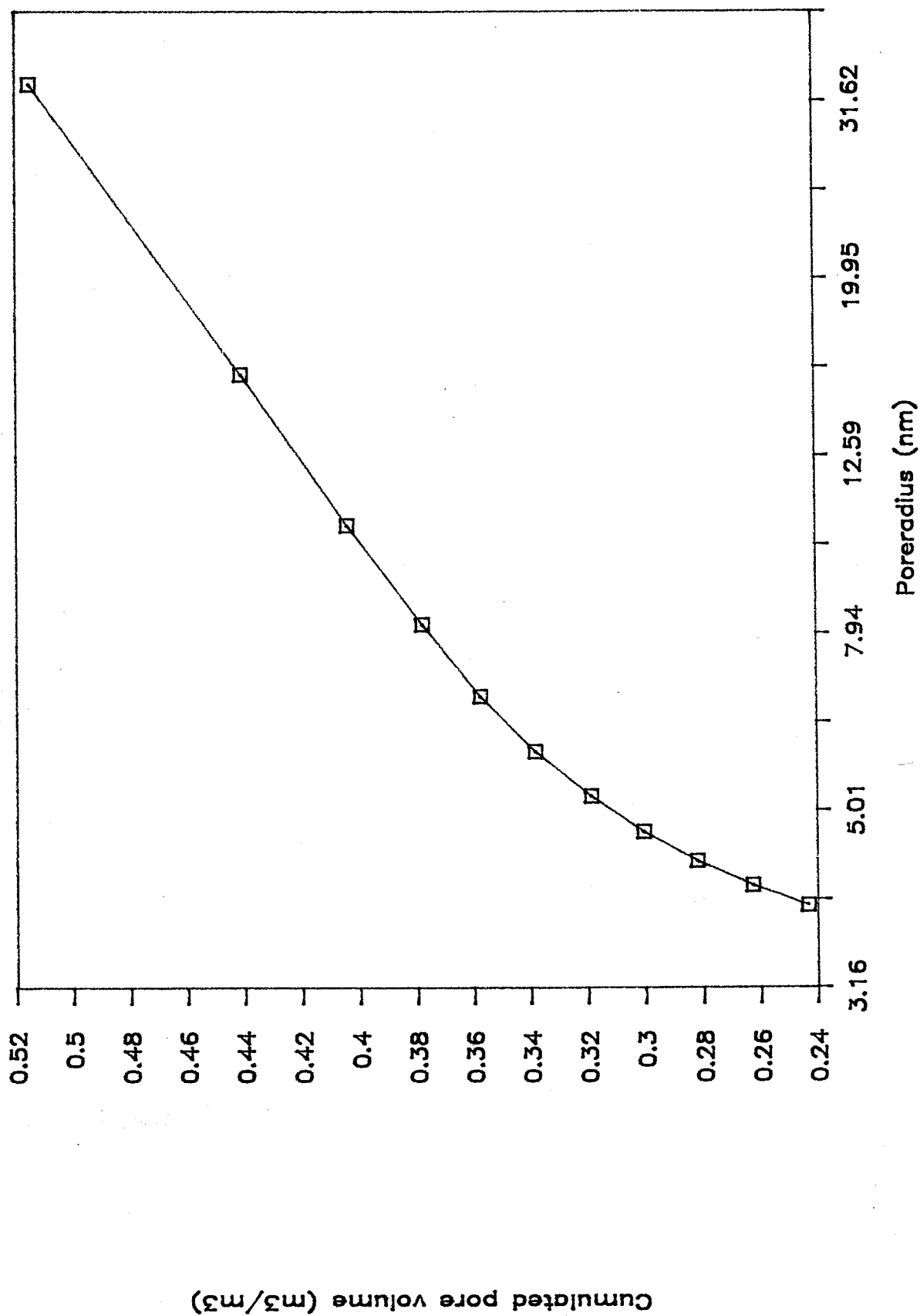
a	b	t	r	M	N	O	P
-1.38629	0.629960	1.24E-09	3.30E-08	2500.723		0 2.94E-10	1.096703
-2.19722	0.480749	9.47E-10	1.55E-08	1285.850	2500.723	1.30E-10	1.150782
-2.63905	0.414913	8.17E-10	1.05E-08	738.5524	3786.574	7.91E-11	1.190666
-2.94443	0.374756	7.38E-10	8.12E-09	438.9615	4525.126	5.53E-11	1.222886
-3.17805	0.346680	6.83E-10	6.73E-09	388.0740	4964.088	4.18E-11	1.249603
-3.36729	0.325487	6.41E-10	5.83E-09	441.2553	5352.162	3.31E-11	1.271891
-3.52636	0.308678	6.08E-10	5.20E-09	180.2747	5793.417	2.72E-11	1.290401
-3.66356	0.294879	5.81E-10	4.74E-09	138.5418	5973.692	2.29E-11	1.305571
-3.78418	0.283258	5.58E-10	4.39E-09	129.2041	6112.234	1.97E-11	1.317718
-3.89182	0.273275	5.38E-10	4.12E-09	130.0804	6241.438	1.72E-11	1.327088
-3.98898	0.264566	5.21E-10	3.91E-09		ERR 6371.518	ERR	ERR

Q	D(Vp)n	SD(Vp)n	T	rm
0.1105	1.21E-04	3.80E-04	0.494	32.99070
0.0303	3.35E-05	2.59E-04	0.336294	15.52002
0.0127	1.38E-05	2.25E-04	0.292799	10.49972
0.0063	6.52E-06	2.11E-04	0.274924	8.117821
0.0047	4.87E-06	2.05E-04	0.266451	6.731267
0.0045	4.87E-06	2.00E-04	0.260114	5.828359
0.002	1.79E-06	1.95E-04	0.253789	5.197828
0.0015	1.26E-06	1.93E-04	0.251461	4.736577
0.0013	1.10E-06	1.92E-04	0.249818	4.388361
0.0012	1.04E-06	1.91E-04	0.248389	4.119968
0.205	ERR	1.90E-04	0.247031	3.910611

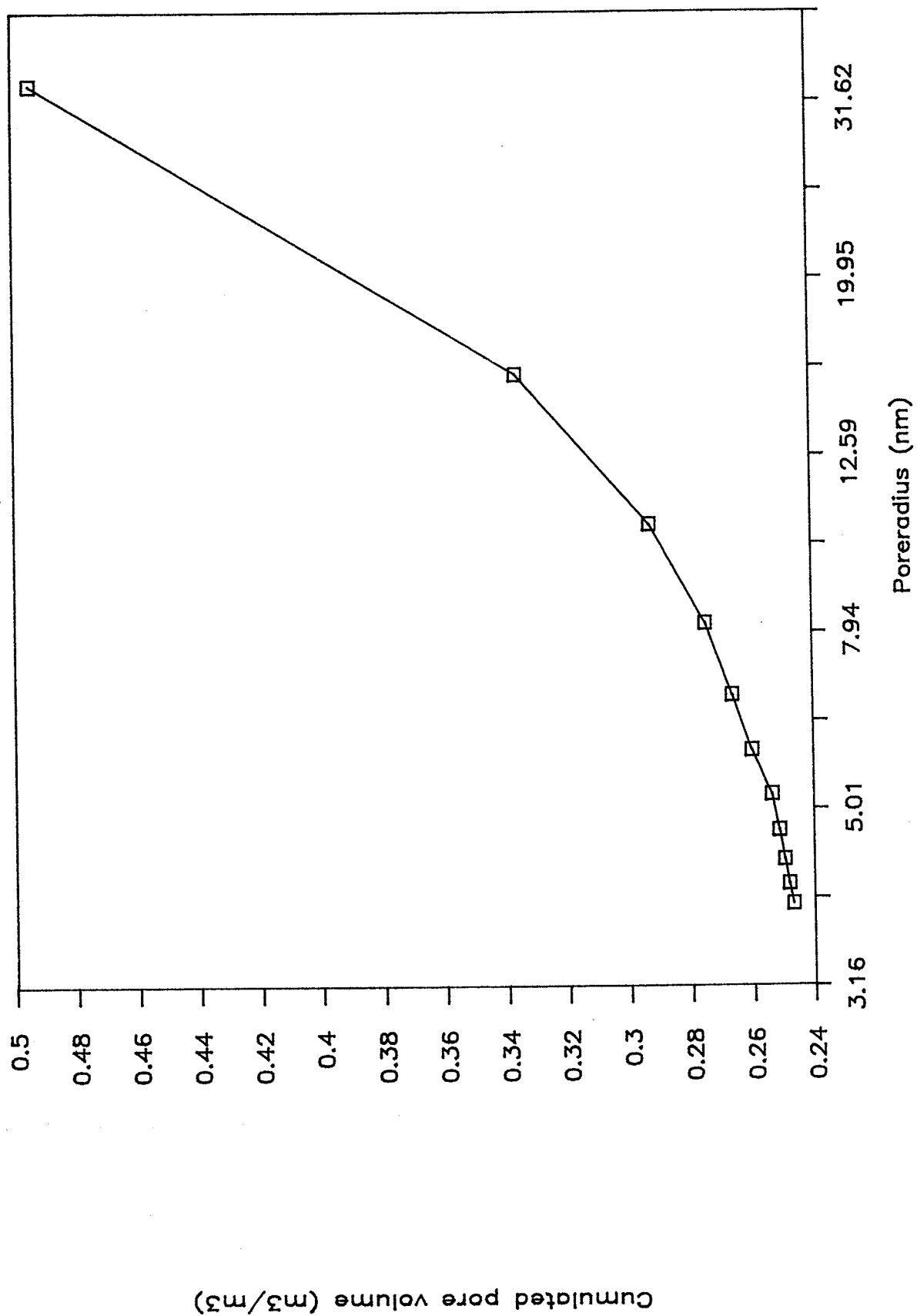
T = y-axis (cumulated pore volume
in m^3/m^3)

rm = x-axis (pore radius in nm)

F5557.cool

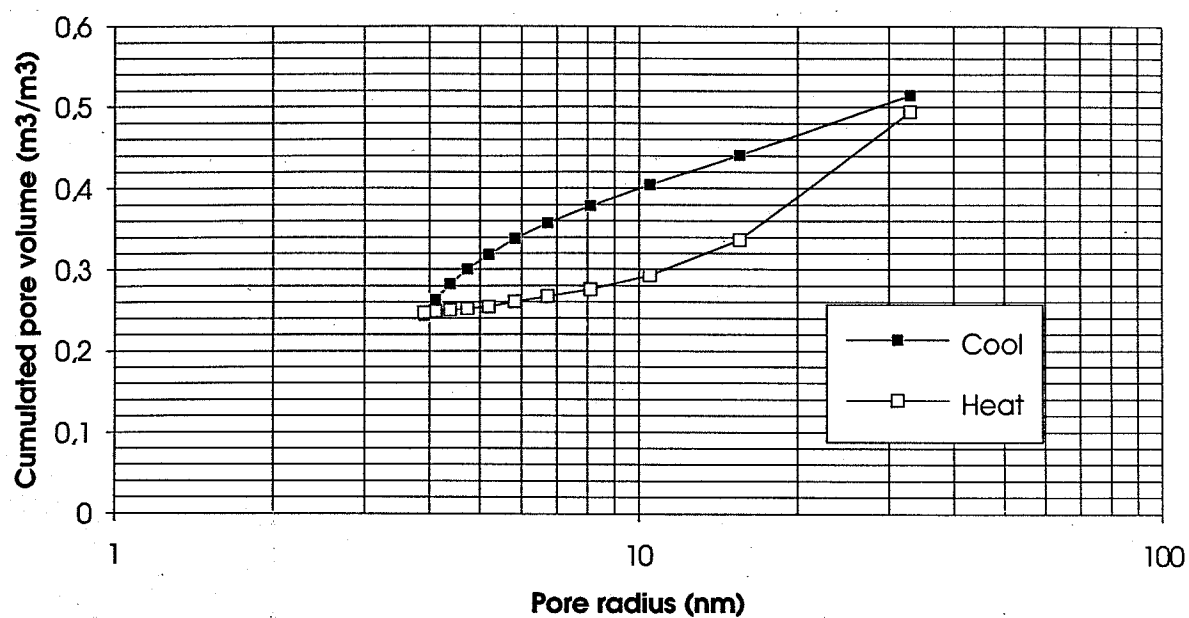


F5557.heat



Graph made by EXCEL

F557, HCP



Low Temperature
Microcalorimetry

MICRO
PORES
width < 2 nm

MESO PORES
2 nm < width < 50 nm

MACRO
PORES
width > 50 nm

(According to IUPAC - conventions.
"Pore size terminology")

Example: Calorimeter tests F572.cool and F577.cool

Sample descriptions:

F572: Hardened cement paste. $v/c = 0.60$. Dried at 50 °C.
Water saturated.

F577: Hardened cement paste. $v/c = 0.60$. Virgin. Stored in water.

3:1 Output from calorimeter test F572.cool.

3:2 Graph C_p nominal versus temperature. F572.cool.

3:3 Output from calorimeter test F577.cool.

3:4 Graph C_p nominal versus temperature. F577.cool.

3:5 Hand calculations with working sheet of Jens Villadsen.
F572.cool.

3:6 Hand calculations with working sheet of Jens Villadsen.
F577.cool.

3:7 Computer calculations with program PORESIZE. F572.cool.

3:8 Computer calculations with program PORESIZE. F577.cool.

3:9 Graph made by PORESIZE: Cumulated pore volume versus pore
radius. F572.cool.

3:10 Graph made by PORESIZE: Cumulated pore volume versus pore
radius. F577.cool.

3:11 Graph made by hand: Cumulated pore volume versus pore
radius. F572.cool and F577.cool.

3:12 Comparison between values calculated by hand and by
computer. Cumulated pore volume $q_d^* (\sum \Delta V_p)_n$ and pore radius r .

TEST NO. F572 COOL

11.APR.1988

sample no. :9.1
 sample weight :15.2817 gram
 sample description :
 Terket ved 50 grader celsius, mettet med
 vand. AgI = 0.00302 g.

start time :151022

t	ts	tc	Ei	Dq/Dt	App. Heat Capacity		Integrated	Dt/Dt
					nominal	true		
Time	Lab/sek	Deg.C	Myvolt	Mcal/sec/g	Cal/deg/g		cal/g	Mdeg/sec
151031	7	18.07	1592	0.4196	-0.4344	0.0000	0.003	0.000
151303	159	17.92	1692	0.4457	-0.4614	-0.4611	0.071	-0.967
151510	286	17.72	1791	0.4719	-0.4886	-0.3084	0.131	-1.530
151712	409	17.58	1890	0.4981	-0.5156	-0.4152	0.192	-1.200
151916	532	17.38	1989	0.5243	-0.5428	-0.3319	0.256	-1.580
152123	659	17.19	2089	0.5506	-0.5699	-0.3572	0.326	-1.541
152255	752	17.04	2159	0.5691	-0.5891	-0.3602	0.379	-1.580
152512	888	16.85	2258	0.5954	-0.6163	-0.4172	0.460	-1.427
152737	1033	16.65	2358	0.6216	-0.6435	-0.4613	0.551	-1.347
152957	1173	16.46	2448	0.6455	-0.6682	-0.4624	0.641	-1.396
153231	1327	16.21	2548	0.6718	-0.6954	-0.4224	0.744	-1.590
153353	1409	16.02	2587	0.6823	-0.7063	-0.2886	0.800	-2.364
153850	1706	15.58	2664	0.7025	-0.7273	-0.4749	1.009	-1.479
154351	2007	15.09	2665	0.7029	-0.7276	-0.4333	1.221	-1.622
154943	2359	14.60	2611	0.6888	-0.7130	-0.4962	1.463	-1.388
155558	2734	14.01	2526	0.6665	-0.6900	-0.4260	1.713	-1.564
160038	3014	13.67	2460	0.6493	-0.6721	-0.5332	1.895	-1.218
160718	3414	13.04	2369	0.6254	-0.6474	-0.3934	2.144	-1.590
161508	3884	12.55	2270	0.5993	-0.6204	-0.5772	2.426	-1.038
162129	4266	12.01	2199	0.5807	-0.6012	-0.4126	2.648	-1.407
162714	4610	11.62	2138	0.5649	-0.5847	-0.4975	2.842	-1.135
163426	5043	11.04	2072	0.5474	-0.5667	-0.4044	3.079	-1.354
164834	5890	10.16	1973	0.5214	-0.5398	-0.5030	3.521	-1.037
164917	5934	10.06	1968	0.5203	-0.5387	-0.2294	3.544	-2.268
170400	6816	9.03	1901	0.5027	-0.5204	-0.4329	3.988	-1.161
171940	7756	8.06	1845	0.4881	-0.5052	-0.4696	4.446	-1.039
173509	8685	7.03	1801	0.4768	-0.4936	-0.4319	4.889	-1.104
175145	9681	6.05	1765	0.4675	-0.4840	-0.4768	5.355	-0.981
180832	10688	5.03	1740	0.4610	-0.4772	-0.4529	5.819	-1.018
182426	11642	4.05	1720	0.4562	-0.4722	-0.4457	6.254	-1.023
184124	12660	3.03	1705	0.4524	-0.4683	-0.4490	6.715	-1.008
185745	13642	2.05	1691	0.4488	-0.4646	-0.4512	7.155	-0.995
191458	14675	1.03	1682	0.4469	-0.4626	-0.4501	7.617	-0.993
192618	15354	0.00	1676	0.4455	-0.4611	-0.2952	7.920	-1.509
194618	16554	-0.78	1677	0.4460	-0.4616	-0.6850	8.455	-0.651
194926	16743	-1.03	1676	0.4459	-0.4616	-0.3442	8.539	-1.295
200542	17718	-2.00	1666	0.4435	-0.4591	-0.4430	8.972	-1.001
202237	18733	-3.03	1659	0.4417	-0.4572	-0.4372	9.420	-1.010
203819	19675	-4.00	1654	0.4408	-0.4564	-0.4253	9.835	-1.037
204526	20102	-4.35	1776	0.4733	-0.4899	-0.5908	10.037	-0.801
204528	20104	-4.35	1905	0.5078	-0.5257	0.0000	10.038	0.000
204529	20105	-4.35	2020	0.5383	-0.5573	0.0000	10.039	0.000
204530	20106	-4.35	2152	0.5735	-0.5937	0.0000	10.039	0.000
204531	20108	-4.35	2369	0.6315	-0.6537	0.0000	10.040	0.000
204533	20109	-4.35	2601	0.6932	-0.7176	0.0000	10.041	0.000
204534	20111	-4.35	2840	0.7569	-0.7835	0.0000	10.042	0.000

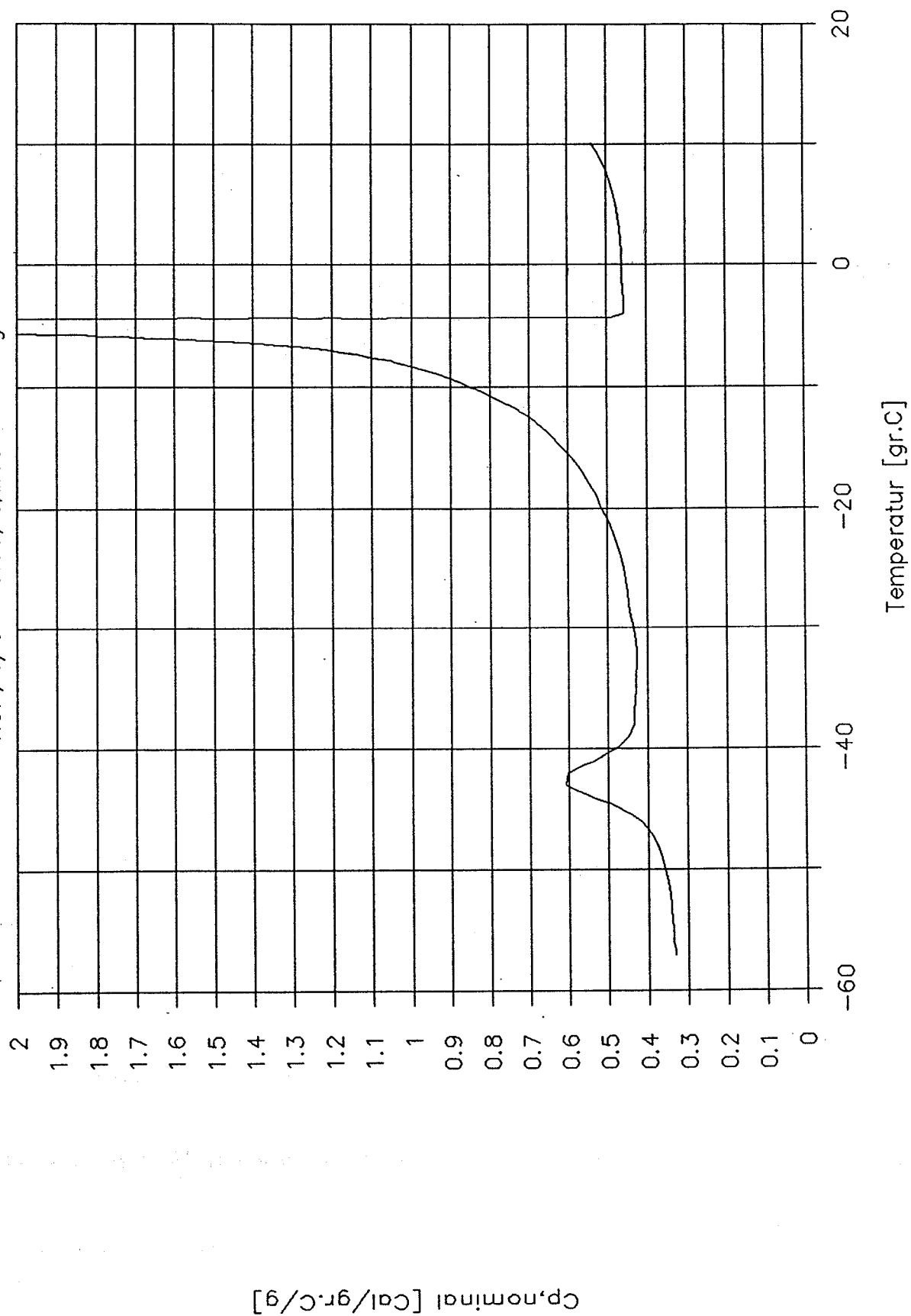
204537	20113	-4.35	3159	0.8421	-0.8717	0.0000	10.044	0.000
204538	20114	-4.35	3395	0.9049	-0.9367	0.0000	10.045	0.000
204539	20115	-4.35	3548	0.9457	-0.9790	0.0000	10.046	0.000
204541	20117	-4.35	3772	1.0054	-1.0408	0.0000	10.048	0.000
204542	20118	-4.39	3918	1.0444	-1.0812	-0.0259	10.049	-40.354
204543	20119	-4.39	4060	1.0823	-1.1204	0.0000	10.050	0.000
204544	20120	-4.39	4198	1.1190	-1.1584	0.0000	10.052	0.000
204545	20121	-4.35	4334	1.1553	-1.1959	0.0234	10.053	49.321
204546	20122	-4.39	4543	1.2110	-1.2536	-0.0300	10.054	-40.354
204547	20124	-4.35	4777	1.2731	-1.3180	0.0329	10.056	38.752
204549	20126	-4.35	5030	1.3408	-1.3880	0.0000	10.058	0.000
204551	20127	-4.39	5201	1.3863	-1.4350	-0.0341	10.060	-40.690
204552	20128	-4.39	5443	1.4508	-1.5019	0.0000	10.062	0.000
204553	20129	-4.35	5665	1.5098	-1.5630	0.0359	10.063	42.093
204554	20130	-4.39	5872	1.5651	-1.6202	-0.0455	10.066	-34.386
204556	20132	-4.39	6064	1.6163	-1.6732	0.0000	10.068	0.000
204557	20133	-4.39	6245	1.6647	-1.7232	0.0000	10.070	0.000
204559	20135	-4.39	6417	1.7105	-1.7707	0.0000	10.074	0.000
204601	20137	-4.39	6639	1.7695	-1.8317	0.0000	10.077	0.000
204603	20139	-4.39	6866	1.8301	-1.8945	0.0000	10.080	0.000
204604	20141	-4.39	7050	1.8791	-1.9452	0.0000	10.083	0.000
204606	20142	-4.39	7241	1.9300	-1.9979	0.0000	10.086	0.000
204607	20144	-4.39	7433	1.9812	-2.0510	0.0000	10.089	0.000
204610	20146	-4.39	7678	2.0465	-2.1186	0.0000	10.094	0.000
204611	20148	-4.39	7851	2.0926	-2.1662	0.0000	10.097	0.000
204613	20149	-4.39	8068	2.1505	-2.2262	0.0000	10.101	0.000
204615	20151	-4.44	8277	2.2064	-2.2840	-0.0917	10.105	-24.053
204617	20153	-4.44	8486	2.2618	-2.3414	0.0000	10.110	0.000
204619	20155	-4.39	8690	2.3162	-2.3977	0.0968	10.115	23.935
204621	20157	-4.39	8887	2.3687	-2.4520	0.0000	10.119	0.000
204623	20159	-4.39	9097	2.4246	-2.5100	0.0000	10.124	0.000
204625	20161	-4.39	9275	2.4722	-2.5592	0.0000	10.129	0.000
204626	20163	-4.39	9459	2.5212	-2.6099	0.0000	10.132	0.000
204628	20164	-4.39	9635	2.5680	-2.6584	0.0000	10.136	0.000
204630	20166	-4.39	9857	2.6272	-2.7197	0.0000	10.141	0.000
204632	20168	-4.44	10058	2.6808	-2.7752	-0.1115	10.146	-24.053
204634	20170	-4.39	10235	2.7281	-2.8241	0.1380	10.153	19.768
204636	20172	-4.44	10424	2.7786	-2.8764	-0.1189	10.159	-23.363
204639	20175	-4.44	10616	2.8297	-2.9293	0.0000	10.167	0.000
204642	20178	-4.44	10795	2.8773	-2.9786	0.0000	10.175	0.000
204644	20180	-4.39	10980	2.9266	-3.0296	0.1217	10.181	24.053
204646	20182	-4.39	11188	2.9821	-3.0870	0.0000	10.187	0.000
204648	20184	-4.44	11402	3.0393	-3.1462	-0.1264	10.193	-24.053
204650	20186	-4.44	11612	3.0953	-3.2043	0.0000	10.199	0.000
204652	20188	-4.44	11813	3.1488	-3.2596	0.0000	10.206	0.000
204654	20190	-4.44	12005	3.2000	-3.3126	0.0000	10.212	0.000
204656	20192	-4.44	12184	3.2478	-3.3621	0.0000	10.219	0.000
204659	20195	-4.44	12392	3.3032	-3.4195	0.0000	10.227	0.000
204701	20197	-4.44	12582	3.3538	-3.4719	0.0000	10.236	0.000
204704	20200	-4.44	12757	3.4004	-3.5201	0.0000	10.244	0.000
204707	20203	-4.44	12949	3.4514	-3.5729	0.0000	10.255	0.000
204710	20206	-4.44	13124	3.4982	-3.6213	0.0000	10.265	0.000
204713	20209	-4.44	13310	3.5477	-3.6726	0.0000	10.278	0.000
204717	20213	-4.44	13499	3.5981	-3.7247	0.0000	10.292	0.000
204722	20218	-4.44	13682	3.6471	-3.7754	0.0000	10.309	0.000
204727	20223	-4.49	13854	3.6929	-3.8229	-0.3819	10.328	-9.669
204733	20229	-4.49	14026	3.7388	-3.8704	0.0000	10.351	0.000
204740	20236	-4.49	14196	3.7841	-3.9173	0.0000	10.377	0.000
204749	20245	-4.49	14369	3.8301	-3.9649	0.0000	10.410	0.000
204800	20256	-4.49	14543	3.8765	-4.0129	0.0000	10.454	0.000
204816	20272	-4.49	14713	3.9220	-4.0600	0.0000	10.517	0.000
205017	20393	-4.64	14541	3.8765	-4.0129	-3.2050	10.987	-1.210
205042	20418	-4.64	14369	3.8305	-3.9653	0.0000	11.082	0.000
205104	20440	-4.64	14197	3.7847	-3.9180	0.0000	11.166	0.000
205125	20461	-4.69	14027	3.7396	-3.8712	-1.5945	11.244	-2.345
205145	20481	-4.69	13855	3.6937	-3.8237	0.0000	11.319	0.000
205205	20501	-4.74	13683	3.6479	-3.7762	-1.4732	11.391	-2.476

205244	20540	-4.74	13338	3.5560	-3.6811	0.0000	11.529	0.000
205303	20559	-4.79	13164	3.5097	-3.6332	-1.3815	11.596	-2.540
205322	20578	-4.79	12994	3.4644	-3.5863	0.0000	11.661	0.000
205340	20596	-4.83	12824	3.4192	-3.5395	-1.3116	11.725	-2.607
205359	20615	-4.83	12655	3.3740	-3.4928	0.0000	11.788	0.000
205418	20634	-4.88	12485	3.3289	-3.4461	-1.2769	11.851	-2.607
205437	20653	-4.88	12313	3.2830	-3.3985	0.0000	11.914	0.000
205456	20673	-4.88	12141	3.2373	-3.3512	0.0000	11.976	0.000
205516	20692	-4.88	11972	3.1920	-3.3044	0.0000	12.038	0.000
205535	20712	-4.98	11799	3.1461	-3.2568	-0.6369	12.100	-4.940
205555	20731	-4.93	11627	3.1003	-3.2094	1.2553	12.161	2.470
205615	20752	-4.98	11454	3.0542	-3.1617	-1.2647	12.223	-2.415
205636	20772	-4.98	11282	3.0084	-3.1143	0.0000	12.284	0.000
205656	20793	-5.08	11109	2.9625	-3.0668	-0.6301	12.345	-4.702
205717	20813	-5.03	10937	2.9166	-3.0192	1.2400	12.406	2.352
205738	20835	-5.13	10765	2.8707	-2.9718	-0.6264	12.467	-4.583
205742	20838	-5.03	10736	2.8629	-2.9637	0.1029	12.477	27.822
205803	20859	-5.08	10567	2.8178	-2.9169	-1.2303	12.537	-2.290
205825	20881	-5.13	10397	2.7726	-2.8701	-1.2350	12.598	-2.245
205847	20903	-5.13	10226	2.7270	-2.8229	0.0000	12.658	0.000
205910	20926	-5.13	10054	2.6812	-2.7755	0.0000	12.720	0.000
205933	20950	-5.18	9882	2.6354	-2.7281	-1.2597	12.781	-2.092
205957	20973	-5.18	9711	2.5897	-2.6808	0.0000	12.843	0.000
210022	20998	-5.22	9540	2.5442	-2.6337	-1.2677	12.905	-2.007
210046	21023	-5.22	9369	2.4988	-2.5867	0.0000	12.967	0.000
210112	21048	-5.27	9197	2.4528	-2.5392	-1.2970	13.030	-1.891
210139	21075	-5.32	9026	2.4074	-2.4922	-1.2997	13.093	-1.852
210206	21102	-5.32	8854	2.3615	-2.4446	0.0000	13.158	0.000
210234	21130	-5.32	8684	2.3161	-2.3977	0.0000	13.222	0.000
210303	21159	-5.42	8513	2.2706	-2.3505	-0.6717	13.288	-3.380
210332	21189	-5.37	8343	2.2252	-2.3035	1.3617	13.354	1.634
210403	21220	-5.42	8172	2.1798	-2.2565	-1.3803	13.422	-1.579
210435	21251	-5.47	8002	2.1346	-2.2097	-1.3950	13.490	-1.530
210509	21285	-5.52	7831	2.0890	-2.1625	-1.4311	13.560	-1.460
210544	21320	-5.52	7660	2.0433	-2.1152	0.0000	13.631	0.000
210620	21356	-5.57	7489	1.9977	-2.0680	-1.4941	13.704	-1.337
210658	21394	-5.62	7318	1.9522	-2.0209	-1.5197	13.778	-1.285
210738	21434	-5.66	7147	1.9066	-1.9737	-1.5615	13.855	-1.221
210820	21476	-5.71	6976	1.8611	-1.9266	-1.6012	13.933	-1.162
210904	21521	-5.71	6806	1.8159	-1.8798	0.0000	14.013	0.000
210951	21567	-5.76	6637	1.7707	-1.8330	-1.6891	14.095	-1.048
211041	21617	-5.86	6466	1.7253	-1.7860	-0.8772	14.181	-1.967
211134	21670	-5.86	6296	1.6798	-1.7389	0.0000	14.270	0.000
211230	21727	-5.96	6125	1.6345	-1.6920	-0.9495	14.363	-1.721
211307	21764	-6.05	6021	1.6066	-1.6632	-0.6090	14.423	-2.638
211411	21827	-6.05	5850	1.5612	-1.6162	0.0000	14.522	0.000
211521	21897	-6.10	5681	1.5160	-1.5694	-2.1538	14.627	-0.704
211636	21972	-6.20	5511	1.4709	-1.5226	-1.1375	14.738	-1.293
211800	22056	-6.30	5342	1.4257	-1.4759	-1.2196	14.858	-1.169
211933	22149	-6.35	5172	1.3803	-1.4289	-2.6350	14.986	-0.524
212117	22253	-6.45	5002	1.3352	-1.3822	-1.4269	15.126	-0.936
212315	22372	-6.59	4833	1.2902	-1.3356	-1.0401	15.278	-1.240
212530	22506	-6.69	4664	1.2451	-1.2889	-1.7178	15.446	-0.725
212801	22657	-6.84	4500	1.2015	-1.2438	-1.2384	15.627	-0.970
212945	22762	-6.98	4400	1.1751	-1.2164	-0.8372	15.750	-1.404
213140	22877	-7.08	4301	1.1486	-1.1891	-1.3522	15.882	-0.849
213349	23005	-7.23	4202	1.1222	-1.1617	-0.9863	16.026	-1.138
213612	23148	-7.37	4102	1.0958	-1.1344	-1.0650	16.182	-1.029
213849	23305	-7.52	4003	1.0694	-1.1070	-1.1504	16.351	-0.930
214144	23481	-7.71	3904	1.0430	-1.0798	-0.9363	16.534	-1.114
214459	23675	-7.86	3805	1.0167	-1.0524	-1.3502	16.731	-0.753
214625	23761	-8.01	3764	1.0058	-1.0412	-0.5913	16.818	-1.701
215011	23987	-8.25	3665	0.9795	-1.0140	-0.9068	17.039	-1.080
215411	24227	-8.45	3566	0.9532	-0.9867	-1.1698	17.268	-0.815
215831	24487	-8.69	3466	0.9268	-0.9595	-0.9869	17.509	-0.939
220312	24768	-8.98	3367	0.9005	-0.9322	-0.8646	17.762	-1.042
220816	25072	-9.28	3268	0.8742	-0.9050	-0.9073	18.028	-0.963

221933	25749	-9.96	3070	0.8216	-0.8505	-0.8379	18.593	-0.980
222052	25828	-10.06	3048	0.8159	-0.8446	-0.6558	18.657	-1.244
222714	26210	-10.40	2949	0.7896	-0.8174	-0.8838	18.959	-0.893
223410	26627	-10.84	2850	0.7633	-0.7902	-0.7228	19.277	-1.056
223620	26756	-11.04	2821	0.7556	-0.7822	-0.5000	19.374	-1.511
224410	27227	-11.43	2722	0.7293	-0.7549	-0.8788	19.717	-0.830
225241	27737	-11.91	2623	0.7030	-0.7277	-0.7357	20.077	-0.956
225326	27782	-12.01	2614	0.7009	-0.7255	-0.3201	20.108	-2.190
230315	28371	-12.55	2515	0.6745	-0.6983	-0.7401	20.505	-0.911
231027	28803	-13.04	2450	0.6572	-0.6803	-0.5812	20.789	-1.131
232248	29544	-13.72	2350	0.6309	-0.6531	-0.6838	21.257	-0.923
232650	29786	-14.01	2322	0.6234	-0.6453	-0.5144	21.407	-1.212
234244	30740	-14.94	2223	0.5973	-0.6183	-0.6143	21.977	-0.972
234356	30812	-15.04	2213	0.5947	-0.6157	-0.4412	22.020	-1.348
235856	31712	-15.92	2114	0.5685	-0.5885	-0.5819	22.532	-0.977
235946	31763	-16.02	2109	0.5673	-0.5873	-0.2943	22.561	-1.928
0	31776	-15.97	2108	0.5671	-0.5870	0.1531	22.568	3.705
1723	32819	-17.04	2021	0.5441	-0.5632	-0.5282	23.135	-1.030
3244	33740	-18.02	1954	0.5266	-0.5452	-0.4968	23.621	-1.060
5047	34824	-19.04	1887	0.5089	-0.5269	-0.5378	24.172	-0.946
10337	35593	-20.02	1845	0.4981	-0.5156	-0.3927	24.556	-1.269
12329	36785	-21.04	1783	0.4819	-0.4988	-0.5601	25.130	-0.860
14013	37789	-22.02	1740	0.4707	-0.4872	-0.4836	25.602	-0.973
15717	38814	-23.05	1702	0.4608	-0.4770	-0.4605	26.074	-1.001
21235	39731	-24.02	1669	0.4524	-0.4683	-0.4252	26.490	-1.064
22933	40750	-25.00	1639	0.4447	-0.4603	-0.4636	26.942	-0.959
24648	41784	-26.03	1615	0.4385	-0.4539	-0.4423	27.396	-0.991
30253	42749	-27.00	1598	0.4345	-0.4498	-0.4293	27.815	-1.012
31952	43768	-28.03	1589	0.4326	-0.4478	-0.4299	28.256	-1.006
33608	44744	-29.00	1571	0.4280	-0.4431	-0.4280	28.674	-1.000
35249	45745	-30.03	1546	0.4217	-0.4366	-0.4115	29.096	-1.025
40906	46723	-31.01	1525	0.4164	-0.4310	-0.4168	29.503	-0.999
42557	47734	-32.03	1514	0.4139	-0.4284	-0.4081	29.921	-1.014
44157	48693	-33.01	1509	0.4131	-0.4276	-0.4058	30.318	-1.018
45841	49698	-34.03	1513	0.4146	-0.4292	-0.4062	30.734	-1.021
51437	50653	-35.01	1518	0.4164	-0.4310	-0.4075	31.132	-1.022
53128	51664	-36.04	1524	0.4185	-0.4332	-0.4124	31.555	-1.015
54637	52573	-37.01	1523	0.4189	-0.4337	-0.3902	31.936	-1.074
60402	53618	-38.04	1525	0.4198	-0.4346	-0.4279	32.375	-0.981
61900	54516	-39.01	1565	0.4314	-0.4466	-0.3965	32.762	-1.088
63346	55402	-39.84	1664	0.4592	-0.4754	-0.4901	33.169	-0.937
63621	55557	-40.04	1688	0.4659	-0.4823	-0.3712	33.241	-1.255
64502	56078	-40.53	1787	0.4935	-0.5109	-0.5265	33.498	-0.937
65140	56477	-41.02	1877	0.5187	-0.5370	-0.4231	33.705	-1.226
65835	56891	-41.36	1976	0.5464	-0.5656	-0.6619	33.931	-0.825
70612	57348	-41.85	2075	0.5742	-0.5944	-0.5382	34.194	-1.067
70845	57501	-42.04	2101	0.5815	-0.6020	-0.4541	34.283	-1.280
72422	58438	-43.02	2123	0.5883	-0.6090	-0.5648	34.834	-1.042
73240	58937	-43.51	2024	0.5612	-0.5810	-0.5726	35.114	-0.980
73829	59285	-43.85	1925	0.5339	-0.5527	-0.5438	35.300	-0.982
74042	59418	-44.04	1884	0.5229	-0.5413	-0.3568	35.369	-1.466
74612	59748	-44.38	1785	0.4956	-0.5131	-0.4791	35.533	-1.034
74950	59966	-44.58	1724	0.4787	-0.4955	-0.5340	35.637	-0.896
75613	60349	-45.02	1626	0.4518	-0.4677	-0.3934	35.810	-1.148
80408	60824	-45.51	1527	0.4246	-0.4395	-0.4132	36.012	-1.027
81212	61308	-46.04	1453	0.4044	-0.4186	-0.3644	36.208	-1.110
82752	62248	-47.02	1356	0.3779	-0.3912	-0.3637	36.563	-1.039
84403	63220	-48.05	1297	0.3621	-0.3748	-0.3430	36.915	-1.056
85937	64153	-49.02	1262	0.3528	-0.3652	-0.3372	37.244	-1.046
91502	65078	-50.00	1236	0.3459	-0.3581	-0.3276	37.564	-1.056
93055	66032	-51.03	1214	0.3402	-0.3521	-0.3164	37.888	-1.075
94644	66980	-52.00	1193	0.3349	-0.3467	-0.3254	38.206	-1.029
100251	67947	-53.03	1175	0.3303	-0.3419	-0.3115	38.525	-1.060
101020	68396	-53.47	1174	0.3302	-0.3419	-0.3370	38.674	-0.980
101809	68866	-54.00	1170	0.3294	-0.3410	-0.2881	38.828	-1.143
103401	69817	-55.03	1161	0.3274	-0.3390	-0.3039	39.140	-1.077
104840	70696	-56.01	1154	0.3259	-0.3374	-0.2933	39.426	-1.111

F572 COOL

HCP, v/c = 0.60, tørtret ved 50 gr. C.



TEST NO. F577 COOL

27.APR.1988

sample no. : NBI 9.61
 sample weight : 15.4077 gram
 sample description :
 Virgin, lagret i vand.
 AgI = 0.00391 g.

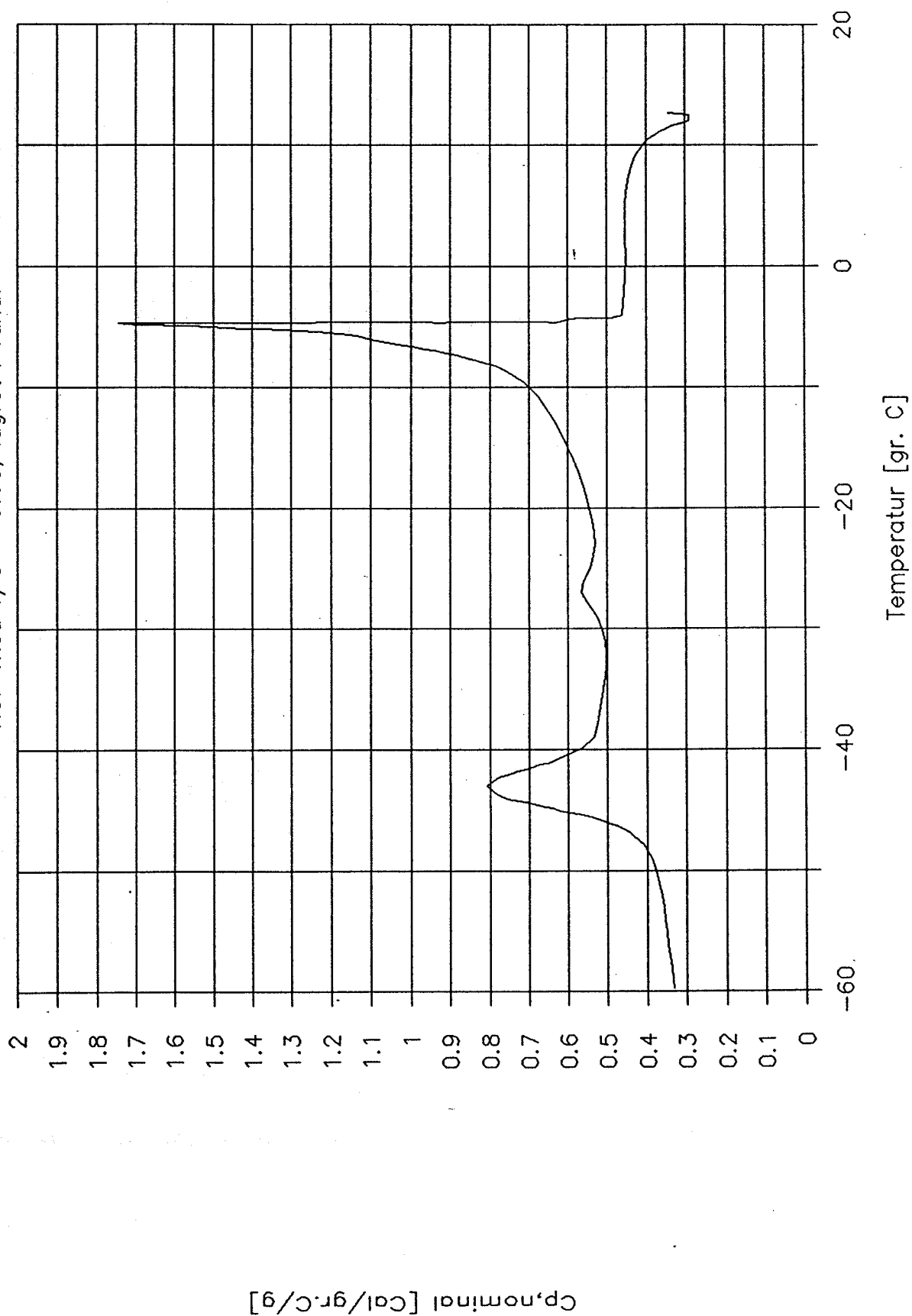
start time : 123026

t	ts	tc	Ei	Dq/Dt	App. Heat Capacity	Integrated	Dt/Dt
					nominal	true	
Time	Lab/sek	Deg.C	Myvolt	Mcal/sec/g	Cal/deg/g	cal/g	Mdeg/sec
123028	0	12.65	1270	0.3326	-0.3443	0.0000	0.000
123232	125	12.55	1171	0.3066	-0.3174	-0.3912	0.038
123528	301	12.50	1072	0.2806	-0.2905	-1.0109	0.088
124638	971	12.01	1071	0.2804	-0.2903	-0.3847	0.275
125039	1212	11.87	1128	0.2956	-0.3060	-0.4869	0.347
125725	1617	11.57	1227	0.3216	-0.3329	-0.4450	0.477
130516	2088	11.18	1327	0.3476	-0.3599	-0.4193	0.641
130738	2230	11.04	1353	0.3545	-0.3670	-0.3434	0.691
131843	2895	10.50	1452	0.3806	-0.3940	-0.4711	0.944
132608	3340	10.06	1500	0.3934	-0.4072	-0.3983	1.119
134439	4451	9.03	1580	0.4145	-0.4291	-0.4492	1.580
140148	5480	8.06	1623	0.4259	-0.4409	-0.4487	2.018
141932	6544	7.03	1648	0.4326	-0.4478	-0.4490	2.479
143616	7548	6.05	1660	0.4360	-0.4514	-0.4482	2.916
145333	8585	5.03	1666	0.4380	-0.4534	-0.4429	3.370
151013	9585	4.05	1668	0.4388	-0.4543	-0.4493	3.809
152718	10611	3.03	1669	0.4392	-0.4546	-0.4393	4.260
154358	11610	2.05	1668	0.4392	-0.4547	-0.4495	4.698
160125	12657	1.03	1661	0.4376	-0.4530	-0.4469	5.157
161738	13631	0.05	1659	0.4373	-0.4527	-0.4359	5.582
161937	13750	-0.05	1660	0.4377	-0.4531	-0.5337	5.634
163535	14708	-1.03	1669	0.4402	-0.4557	-0.4318	6.056
165240	15732	-2.00	1675	0.4422	-0.4578	-0.4640	6.509
170949	16762	-3.03	1685	0.4450	-0.4606	-0.4467	6.967
172608	17741	-4.00	1690	0.4465	-0.4623	-0.4477	7.404
173035	18008	-4.25	1797	0.4750	-0.4917	-0.5195	7.531
173041	18014	-4.25	1902	0.5027	-0.5204	0.0000	7.534
173054	18026	-4.30	2001	0.5290	-0.5476	-0.1315	7.541
173149	18082	-4.30	2100	0.5553	-0.5748	0.0000	7.572
173259	18151	-4.39	2200	0.5815	-0.6020	-0.4134	7.612
173614	18346	-4.64	2299	0.6079	-0.6293	-0.4858	7.731
173616	18349	-4.59	2427	0.6418	-0.6644	0.0302	7.732
173617	18350	-4.59	2547	0.6733	-0.6970	0.0000	7.733
173619	18351	-4.59	2672	0.7066	-0.7315	0.0000	7.734
173620	18353	-4.59	2799	0.7402	-0.7662	0.0000	7.735
173622	18354	-4.59	2925	0.7733	-0.8005	0.0000	7.736
173624	18356	-4.59	3046	0.8054	-0.8337	0.0000	7.738
173625	18357	-4.59	3163	0.8362	-0.8656	0.0000	7.739
173627	18359	-4.59	3275	0.8660	-0.8964	0.0000	7.740
173628	18360	-4.64	3386	0.8954	-0.9269	-0.0281	7.742
173630	18362	-4.59	3498	0.9249	-0.9575	0.0282	7.743
173631	18364	-4.59	3613	0.9552	-0.9888	0.0000	7.744
173633	18365	-4.59	3731	0.9866	-1.0213	0.0000	7.746
173634	18367	-4.59	3855	1.0193	-1.0551	0.0000	7.748
173636	18369	-4.59	3977	1.0516	-1.0886	0.0000	7.750

173639	18371	-4.59	4213	1.1138	-1.1530	0.0000	7.752	0.000
173640	18373	-4.59	4322	1.1426	-1.1829	0.0000	7.754	0.000
173642	18374	-4.59	4427	1.1704	-1.2116	0.0000	7.756	0.000
173645	18377	-4.64	4619	1.2214	-1.2644	-0.0755	7.760	-16.168
173648	18380	-4.64	4793	1.2674	-1.3120	0.0000	7.764	0.000
173651	18384	-4.64	4973	1.3149	-1.3612	0.0000	7.768	0.000
173655	18388	-4.64	5153	1.3625	-1.4104	0.0000	7.774	0.000
173700	18392	-4.64	5327	1.4085	-1.4580	0.0000	7.780	0.000
173706	18398	-4.64	5508	1.4564	-1.5076	0.0000	7.788	0.000
173712	18405	-4.64	5685	1.5032	-1.5561	0.0000	7.798	0.000
173720	18413	-4.64	5860	1.5495	-1.6040	0.0000	7.811	0.000
173731	18423	-4.69	6033	1.5953	-1.6515	-0.3483	7.828	-4.580
173746	18439	-4.69	6204	1.6405	-1.6982	0.0000	7.853	0.000
173825	18477	-4.69	6373	1.6852	-1.7445	0.0000	7.918	0.000
173955	18567	-4.79	6204	1.6406	-1.6983	-1.5151	8.066	-1.083
174040	18613	-4.83	6034	1.5956	-1.6517	-1.4897	8.138	-1.071
174127	18659	-4.88	5864	1.5507	-1.6052	-1.4653	8.210	-1.058
174215	18708	-4.93	5694	1.5058	-1.5588	-1.4991	8.283	-1.004
174306	18758	-4.98	5523	1.4608	-1.5122	-1.5165	8.357	-0.963
174400	18812	-5.08	5353	1.4159	-1.4657	-0.7781	8.433	-1.820
174456	18869	-5.13	5184	1.3711	-1.4194	-1.5947	8.511	-0.860
174600	18933	-5.18	5014	1.3263	-1.3729	-1.7335	8.596	-0.765
174714	19006	-5.22	4844	1.2814	-1.3265	-1.9272	8.690	-0.665
174838	19091	-5.32	4675	1.2367	-1.2802	-1.0718	8.794	-1.154
175019	19191	-5.42	4506	1.1920	-1.2339	-1.2249	8.914	-0.973
175131	19263	-5.47	4406	1.1657	-1.2068	-1.7177	8.998	-0.679
175300	19352	-5.57	4307	1.1396	-1.1797	-1.0402	9.099	-1.096
175448	19460	-5.66	4207	1.1133	-1.1524	-1.2361	9.220	-0.901
175709	19602	-5.81	4108	1.0871	-1.1254	-1.0488	9.374	-1.037
175945	19758	-6.01	4019	1.0637	-1.1012	-0.8502	9.540	-1.251
180250	19943	-6.20	3920	1.0376	-1.0742	-0.9828	9.732	-1.056
180550	20122	-6.35	3821	1.0115	-1.0471	-1.2387	9.913	-0.817
180838	20291	-6.49	3722	0.9854	-1.0201	-1.1317	10.079	-0.871
181123	20456	-6.64	3622	0.9591	-0.9929	-1.0814	10.237	-0.887
181405	20617	-6.84	3523	0.9330	-0.9658	-0.7722	10.388	-1.208
181650	20782	-6.98	3424	0.9069	-0.9388	-1.0225	10.538	-0.887
181942	20954	-7.18	3325	0.8807	-0.9117	-0.7742	10.689	-1.138
182247	21140	-7.32	3226	0.8545	-0.8846	-1.0817	10.848	-0.790
182613	21346	-7.52	3127	0.8284	-0.8576	-0.8748	11.018	-0.947
183010	21582	-7.81	3027	0.8022	-0.8305	-0.6467	11.208	-1.240
183255	21748	-8.01	2967	0.7865	-0.8142	-0.6673	11.338	-1.179
183803	22056	-8.25	2868	0.7603	-0.7871	-0.9596	11.573	-0.792
184425	22437	-8.64	2769	0.7343	-0.7601	-0.7163	11.852	-1.025
185023	22796	-9.03	2693	0.7143	-0.7394	-0.6562	12.109	-1.089
190046	23418	-9.62	2594	0.6883	-0.7125	-0.7310	12.537	-0.942
190641	23773	-10.01	2549	0.6766	-0.7004	-0.6152	12.777	-1.100
192210	24703	-10.89	2450	0.6507	-0.6736	-0.6882	13.382	-0.946
192346	24798	-11.04	2442	0.6487	-0.6715	-0.4217	13.444	-1.538
193941	25753	-12.01	2362	0.6281	-0.6502	-0.6144	14.044	-1.022
195717	26809	-13.04	2295	0.6107	-0.6322	-0.6290	14.689	-0.971
201327	27779	-14.01	2237	0.5959	-0.6168	-0.5918	15.267	-1.007
203056	28829	-15.04	2177	0.5804	-0.6008	-0.5940	15.876	-0.977
204726	29819	-16.02	2125	0.5668	-0.5868	-0.5745	16.437	-0.987
210447	30859	-17.04	2075	0.5540	-0.5735	-0.5624	17.014	-0.985
212112	31844	-18.02	2037	0.5443	-0.5635	-0.5489	17.550	-0.992
213825	32877	-19.04	2001	0.5352	-0.5541	-0.5391	18.102	-0.993
215457	33869	-20.02	1968	0.5270	-0.5455	-0.5355	18.625	-0.984
221208	34900	-21.04	1939	0.5197	-0.5380	-0.5224	19.161	-0.995
222745	35837	-22.02	1919	0.5147	-0.5328	-0.4938	19.643	-1.042
224528	36900	-23.05	1911	0.5131	-0.5312	-0.5320	20.189	-0.964
230152	37885	-24.02	1925	0.5174	-0.5356	-0.5214	20.698	-0.992
231822	38875	-25.00	1950	0.5248	-0.5433	-0.5322	21.218	-0.986
233441	39853	-26.03	2014	0.5425	-0.5616	-0.5175	21.748	-1.048
235149	40881	-27.00	2031	0.5475	-0.5668	-0.5765	22.311	-0.950
0	41372	-27.44	2002	0.5401	-0.5591	-0.6035	22.577	-0.895
853	41905	-28.03	1960	0.5290	-0.5477	-0.4800	22.806	-1.100
2505	42877	-29.00	1883	0.5087	-0.5267	-0.5063	23.353	-1.005

5819	44871	-31.01	1810	0.4902	-0.5075	-0.5066	24.337	-0.968
11525	45897	-32.03	1796	0.4868	-0.5040	-0.4870	24.836	-1.000
13140	46872	-33.01	1793	0.4867	-0.5038	-0.4862	25.311	-1.001
14815	47867	-34.03	1803	0.4900	-0.5072	-0.4754	25.799	-1.031
20354	48806	-35.01	1816	0.4940	-0.5114	-0.4751	26.262	-1.040
22204	49897	-36.04	1832	0.4990	-0.5166	-0.5305	26.806	-0.941
23801	50853	-37.01	1851	0.5048	-0.5226	-0.4946	27.289	-1.021
25435	51847	-38.04	1863	0.5087	-0.5267	-0.4931	27.795	-1.032
31114	52846	-39.01	1890	0.5167	-0.5349	-0.5285	28.311	-0.978
32522	53695	-39.84	1989	0.5444	-0.5636	-0.5567	28.773	-0.978
32814	53867	-40.04	2022	0.5535	-0.5730	-0.4869	28.868	-1.137
33526	54298	-40.43	2121	0.5809	-0.6014	-0.6421	29.119	-0.905
34116	54648	-40.82	2220	0.6084	-0.6298	-0.5446	29.332	-1.117
34348	54801	-41.02	2268	0.6216	-0.6435	-0.4856	29.427	-1.280
34848	55100	-41.26	2367	0.6490	-0.6718	-0.7960	29.621	-0.815
35329	55381	-41.55	2466	0.6764	-0.7002	-0.6493	29.811	-1.042
35805	55657	-41.80	2565	0.7039	-0.7286	-0.7962	30.006	-0.884
40121	55854	-42.04	2633	0.7227	-0.7481	-0.5806	30.147	-1.245
40640	56173	-42.33	2732	0.7502	-0.7766	-0.8174	30.387	-0.918
41551	56724	-42.92	2831	0.7780	-0.8054	-0.7314	30.815	-1.064
41718	56811	-43.02	2836	0.7795	-0.8069	-0.6958	30.883	-1.120
42949	57561	-43.75	2737	0.7530	-0.7795	-0.7715	31.448	-0.976
43408	57821	-44.04	2647	0.7285	-0.7541	-0.6450	31.637	-1.129
43759	58052	-44.24	2548	0.7014	-0.7261	-0.8300	31.800	-0.845
44124	58257	-44.43	2449	0.6743	-0.6980	-0.7070	31.938	-0.954
44436	58449	-44.63	2350	0.6472	-0.6700	-0.6364	32.062	-1.017
44744	58636	-44.82	2250	0.6200	-0.6418	-0.5953	32.178	-1.042
45011	58783	-45.02	2173	0.5988	-0.6199	-0.4504	32.266	-1.329
45326	58978	-45.17	2073	0.5716	-0.5917	-0.7614	32.378	-0.751
45654	59186	-45.41	1974	0.5444	-0.5635	-0.4644	32.491	-1.172
50046	59418	-45.61	1875	0.5171	-0.5353	-0.6131	32.611	-0.843
50515	59687	-45.90	1776	0.4899	-0.5072	-0.4501	32.743	-1.089
50629	59761	-46.04	1751	0.4832	-0.5003	-0.2439	32.778	-1.981
51217	60109	-46.34	1652	0.4561	-0.4721	-0.5419	32.937	-0.842
52015	60588	-46.83	1552	0.4289	-0.4440	-0.4203	33.142	-1.021
52254	60746	-47.02	1527	0.4220	-0.4369	-0.3429	33.209	-1.231
53656	61589	-47.85	1428	0.3951	-0.4090	-0.4009	33.542	-0.986
53935	61747	-48.05	1414	0.3914	-0.4052	-0.3179	33.604	-1.231
55512	62685	-49.02	1355	0.3755	-0.3887	-0.3605	33.956	-1.042
61045	63618	-50.00	1313	0.3645	-0.3773	-0.3482	34.296	-1.047
62724	64616	-51.03	1283	0.3565	-0.3691	-0.3471	34.652	-1.027
64245	65538	-52.00	1261	0.3511	-0.3634	-0.3314	34.976	-1.059
65855	66507	-53.03	1244	0.3468	-0.3590	-0.3279	35.312	-1.058
71421	67433	-54.00	1228	0.3428	-0.3549	-0.3250	35.629	-1.055
73014	68387	-55.03	1216	0.3400	-0.3519	-0.3162	35.954	-1.075
74535	69307	-56.01	1201	0.3365	-0.3484	-0.3171	36.263	-1.061
80154	70287	-57.03	1180	0.3312	-0.3428	-0.3164	36.588	-1.047
81713	71205	-58.01	1165	0.3273	-0.3389	-0.3078	36.888	-1.063
83318	72171	-59.03	1150	0.3238	-0.3352	-0.3050	37.201	-1.062
84339	72792	-59.67	1141	0.3214	-0.3327	-0.3143	37.401	-1.023
84421	72834	-59.67	1140	0.3211	-0.3324	0.0000	37.414	0.000
84535	72907	-59.77	1146	0.3231	-0.3344	-0.2431	37.438	-1.329
84618	72950	-59.77	1147	0.3232	-0.3346	0.0000	37.452	0.000

F577 COOL

HCP med $v/c = 0.60$, lagret i vand.

PORESTRUKTURES FØRDELINGSKURVEN
 FØR LØS I DET FINPORØSE OMRADE
 BESTEMT V.H.A. MIKROKALORIMETRI
 KØRSELSNR. 572 $Q_d = 1300 \frac{\text{kJ}}{\text{g}}$

HÆRDNET CEMENTPASTA

V/C = 0.60

TÆRRET V. 50°C, gennemtøjet.

$$(\Delta V_p)_n = \left[A \times \frac{1}{g_n} - 4.184 C \right] \times D$$

Index n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ΔT																	
K																	
$w_{kf}(\Delta T)$																	
$\rho_w(\Delta T)$																	
$\Delta H(\Delta T)$																	
$\sigma_{lg}(\Delta T)$																	
r_k																	
$\tau(\Delta T)$																	
r																	
$\frac{(\Delta V_p)_n}{r_{n-1} + r_n}$																	
$\sum_{i=0}^{n-1} \frac{(\Delta V_p)_i}{r_{i-1} + r_i}$																	
$t_{n-1} - t_n$																	
$\frac{(r_{n-1} + r_n)^3}{(r_n)^3 + (r_n)^3}$																	
$(w_{kf})_{n-1} - (w_{kf})_n$																	
$\frac{g \cdot h_2 O}{g \cdot \text{tor}}$																	
$\frac{m^3}{kg \cdot \text{tor}}$																	
$(\Delta V_p)_n$																	
$(\sum \Delta V_p)_n$																	
$s_d(\sum \Delta V_p)_n$																	

PROBESTØRELSES FØRDELINGSKURVEN
FØR 48 I DET FINPORØSE OMRÅDE
BESTEMT V.H.A. MIKROKALORIMETRI
KØRSELSNR. 577 $SD = 1300 \frac{kg}{m^3}$

HÆRNET CEMENT PASTA

$v/c = 0,60$ Jan Fev 1971
lognet i vand.

$$(\Delta V_P)_n = \left[A \times \frac{1}{S_n} - 4,81C \right] \times D$$

Index n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ΔT		ΔT	$w_H(\Delta T)$	$\rho_n(\Delta T)$	$\Delta H(\Delta T)$	$\sigma_{lg}(\Delta T)$	r_K	$t/(\Delta T)$	r	$\frac{(\Delta V_P)_n}{r_{n-1} + r_n}$	$\sum_{i=0}^{n-1} \frac{(\Delta V_P)_i}{r_{i-1} + r_i}$	$t_{n-1} - t_n$	$\frac{(r_{n-1} + r_n)^2}{(r_n + r_{n-1})^2}$	$(w_H)_{n-1} - (w_H)_n$	$(\Delta V)_n$	$(\sum \Delta V)_n$	$SD(\sum \Delta V)_n$
K		K	$\frac{g H_2O}{g tør}$	$\frac{kg}{m^3}$	$\frac{J}{mol \cdot K}$	$\frac{N}{mm}$	$10^{-9} m$	$10^{-9} m$	$10^{-9} m$	$\frac{m^2}{kg tør}$	$\frac{m^2}{kg tør}$	$10^{-9} m$	—	$\frac{g H_2O}{g tør}$	$\frac{m^3}{kg tør}$	$\frac{m^3}{kg tør}$	$\frac{m^3}{m^3}$
0		4	0,407	998,96	5867,49	$7620 \cdot 10^{-3}$	31,7	1,24	32,9	929,90	0	0,29	1,097	0,041	$451 \cdot 10^{-6}$	$407 \cdot 10^{-6}$	0,529
1		9	0,366	997,66	5687,34	7689	14,6	0,95	15,6	865,90	929,90	0,13	1,154	0,020	22,6	361,9	0,471
2		14	0,346	996,36	5507,19	7758	9,7	0,82	10,5	983,87	1795,80	0,08	1,183	0,016	18,3	339,3	0,441
3		19	0,330	995,06	5327,04	7827	7,4	0,74	8,1	774,51	2779,67	0,06	1,220	0,010	11,5	321,0	0,417
4		24	0,320	993,76	5146,89	7896	6,0	0,68	6,7	1148,56	3554,18	0,04	1,246	0,012	14,4	309,5	0,402
5		29	0,308	992,46	4966,74	7965	5,2	0,64	5,8	1092,55	4702,74	0,03	1,260	0,010	12,0	295,1	0,384
6		34	0,298	991,16	4786,59	8034	4,6	0,61	5,2	1736,13	5795,29	0,03	1,291	0,014	17,4	283,1	0,368
7		39	0,284	989,86	4606,44	8102	4,2	0,58	4,8	1949,92	7531,42	0,02	1,323	0,014	17,9	265,7	0,345
8		44	0,270	988,56	4426,29	8171	3,8	0,56	4,4	2082,35	9481,34	0,02	1,319	0,014	17,7	247,8	0,322
9		49	0,256	987,26	4246,14	8239	3,6	0,54	4,1	2167,02	11563,69	0,02	1,306	0,014	17,3	230,1	0,299
10		54	0,242	985,96	4065,99	8307	3,4	0,52	3,9		13730,7					212,8	0,277

Computer calculations with program PORESIZE.

F572 Hardened cement paste
v/c = 0.60, Dried at 50°C, resaturated

ro(d)	index	DT	Wnf	ro(w)	DH	sigma	rk
1300	0	4	0.403	998.96	5867.485	0.076196	3.17E-08
	1	9	0.306	997.66	5687.335	0.076890	1.46E-08
	2	14	0.274	996.36	5507.185	0.077582	9.68E-09
	3	19	0.256	995.06	5327.035	0.078273	7.38E-09
	4	24	0.246	993.76	5146.885	0.078962	6.05E-09
	5	29	0.24	992.46	4966.735	0.079650	5.19E-09
	6	34	0.232	991.16	4786.585	0.080337	4.59E-09
	7	39	0.228	989.86	4606.435	0.081021	4.16E-09
	8	44	0.222	988.56	4426.285	0.081705	3.83E-09
	9	49	0.216	987.26	4246.135	0.082387	3.58E-09
	10	54	0.212	985.96	4065.985	0.083067	3.39E-09

a	b	t	r	M	N	O	P
-1.38629	0.629960	1.24E-09	3.30E-08	2195.205		0	2.94E-10
-2.19722	0.480749	9.47E-10	1.55E-08	1368.223	2195.205	1.30E-10	1.150782
-2.63905	0.414913	8.17E-10	1.05E-08	1083.262	3563.428	7.91E-11	1.190666
-2.94443	0.374756	7.38E-10	8.12E-09	742.9702	4646.691	5.53E-11	1.222886
-3.17805	0.346680	6.83E-10	6.73E-09	511.1566	5389.661	4.18E-11	1.249603
-3.36729	0.325487	6.41E-10	5.83E-09	839.6717	5900.818	3.31E-11	1.271891
-3.52636	0.308678	6.08E-10	5.20E-09	428.9996	6740.490	2.72E-11	1.290401
-3.66356	0.294879	5.81E-10	4.74E-09	773.3165	7169.489	2.29E-11	1.305571
-3.78418	0.283258	5.58E-10	4.39E-09	843.2345	7942.806	1.97E-11	1.317718
-3.89182	0.273275	5.38E-10	4.12E-09	569.9055	8786.041	1.72E-11	1.327088
-3.98898	0.264566	5.21E-10	3.91E-09	ERR	9355.946	ERR	ERR

Q	D(Vp)n	SD(Vp)n	T	rnrm
0.097	1.06E-04	4.03E-04	0.5239	32.99070
0.032	3.56E-05	2.97E-04	0.385461	15.52002
0.018	2.02E-05	2.61E-04	0.339180	10.49972
0.01	1.10E-05	2.41E-04	0.312962	8.117821
0.006	6.42E-06	2.30E-04	0.298620	6.731267
0.008	9.26E-06	2.23E-04	0.290274	5.828359
0.004	4.26E-06	2.14E-04	0.278238	5.197828
0.006	7.06E-06	2.10E-04	0.272698	4.736577
0.006	7.17E-06	2.03E-04	0.263524	4.388361
0.004	4.58E-06	1.96E-04	0.254197	4.119968
0.212	ERR	1.91E-04	0.248248	3.910611

T = y-axis (cumulated pore volume
in m^3/m^3)

rnrm = x-axis (pore radius in nm)

Computer calculations with program PORESIZE.

F577 Hardened cement paste
v/c = 0.60, Stored in water

ro(d)	index	DT	Wnf	ro(w)	DH	sigma	rk
1300	0	4	0.407	998.96	5867.485	0.076196	3.17E-08
	1	9	0.366	997.66	5687.335	0.076890	1.46E-08
	2	14	0.346	996.36	5507.185	0.077582	9.68E-09
	3	19	0.33	995.06	5327.035	0.078273	7.38E-09
	4	24	0.32	993.76	5146.885	0.078962	6.05E-09
	5	29	0.308	992.46	4966.735	0.079650	5.19E-09
	6	34	0.298	991.16	4786.585	0.080337	4.59E-09
	7	39	0.284	989.86	4606.435	0.081021	4.16E-09
	8	44	0.27	988.56	4426.285	0.081705	3.83E-09
	9	49	0.256	987.26	4246.135	0.082387	3.58E-09
	10	54	0.242	985.96	4065.985	0.083067	3.39E-09

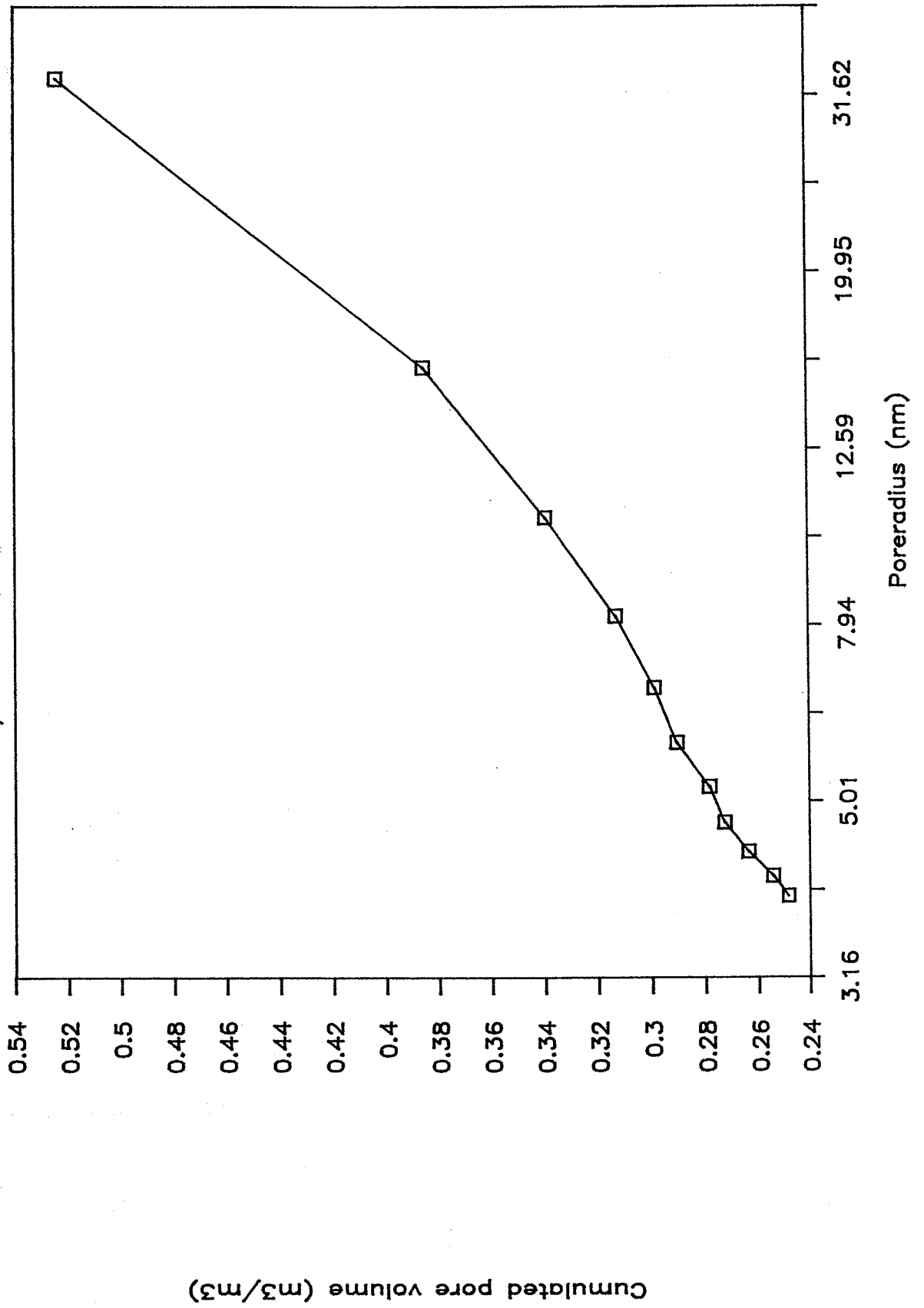
a	b	t	r	M	N	O	P
-1.38629	0.629960	1.24E-09	3.30E-08	927.8701		0 2.94E-10	1.096703
-2.19722	0.480749	9.47E-10	1.55E-08	865.3303	927.8701	1.30E-10	1.150782
-2.63905	0.414913	8.17E-10	1.05E-08	990.7125	1793.200	7.91E-11	1.190666
-2.94443	0.374756	7.38E-10	8.12E-09	776.9095	2783.913	5.53E-11	1.222886
-3.17805	0.346680	6.83E-10	6.73E-09	1142.254	3560.822	4.18E-11	1.249603
-3.36729	0.325487	6.41E-10	5.83E-09	1090.427	4703.077	3.31E-11	1.271891
-3.52636	0.308678	6.08E-10	5.20E-09	1752.881	5793.504	2.72E-11	1.290401
-3.66356	0.294879	5.81E-10	4.74E-09	1924.721	7546.386	2.29E-11	1.305571
-3.78418	0.283258	5.58E-10	4.39E-09	2077.946	9471.108	1.97E-11	1.317718
-3.89182	0.273275	5.38E-10	4.12E-09	2212.439	11549.05	1.72E-11	1.327088
-3.98898	0.264566	5.21E-10	3.91E-09		ERR 13761.49	ERR	ERR

Q	D(Vp)n	SD(Vp)n	T	rnm
0.041	4.50E-05	4.07E-04	0.5291	32.99070
0.02	2.25E-05	3.62E-04	0.470584	15.52002
0.016	1.84E-05	3.39E-04	0.441314	10.49972
0.01	1.15E-05	3.21E-04	0.417336	8.117821
0.012	1.43E-05	3.09E-04	0.402339	6.731267
0.01	1.20E-05	2.95E-04	0.383688	5.828359
0.014	1.74E-05	2.83E-04	0.368058	5.197828
0.014	1.76E-05	2.66E-04	0.345420	4.736577
0.014	1.77E-05	2.48E-04	0.322588	4.388361
0.014	1.78E-05	2.30E-04	0.299605	4.119968
0.242	ERR	2.13E-04	0.276507	3.910611

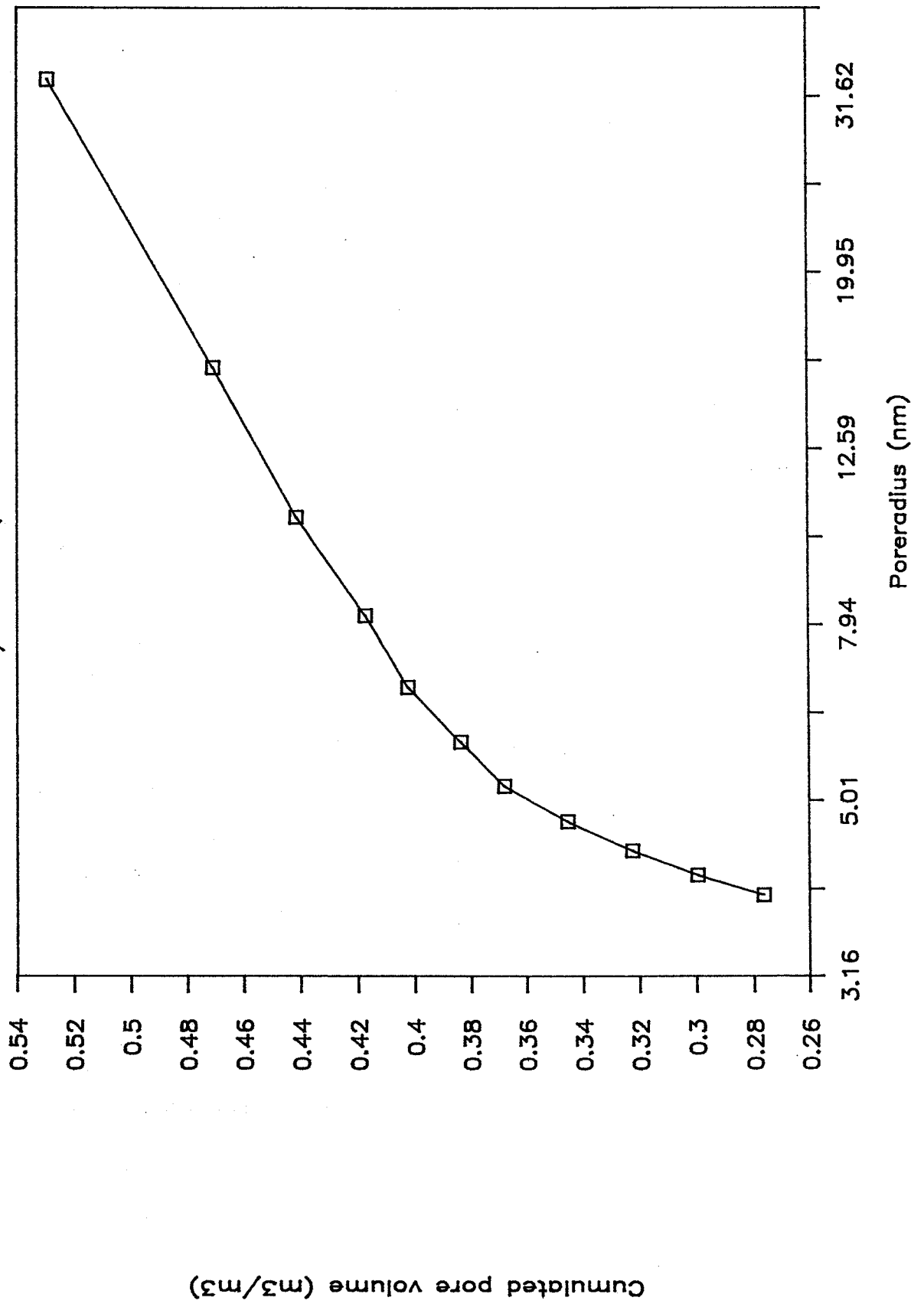
T = y-axis (cumulated pore volume
in m^3/m^3)

rnm = x-axis (pore radius in nm)

F572 Hardened cement paste

 $v/c = 0.60$, Dried at 50°C, resaturated

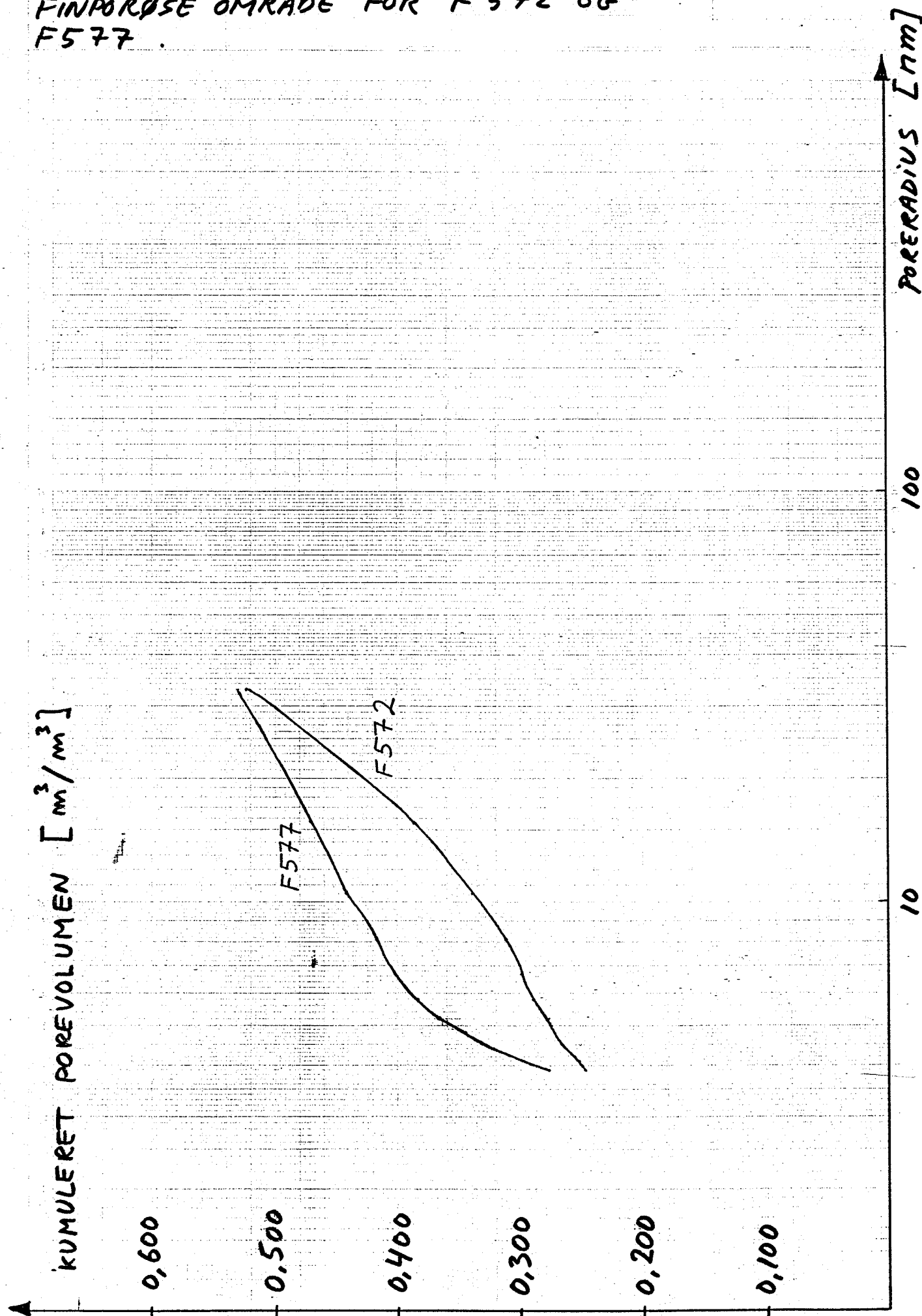
F577 Hardened cement paste

 $v/c = 0.60$, Stored in water

MIKROKALORIMETRI

PORESTØRRELSERFORDELINGER I DET
FINPORØSE OMRADE FOR F572 OG
F577 .

Appendix 3:11



**Comparison between values calculated
by hand and by computer**

Pore radius r (nm)			
F572		F577	
hand	computer	hand	computer
32.9	32.99070	32.9	32.99070
15.6	15.52002	15.6	15.52002
10.5	10.49972	10.5	10.49972
8.1	8.117821	8.1	8.117821
6.7	6.731267	6.7	6.731267
5.8	5.828359	5.8	5.828359
5.2	5.197828	5.2	5.197828
4.8	4.736577	4.8	4.736577
4.4	4.388361	4.4	4.388361
4.1	4.119968	4.1	4.119968
3.9	3.910611	3.9	3.910611

Cumulated pore volume $q_d^*(\sum \Delta V_p)_n$ (m ³ /m ³)			
F572		F577	
hand	computer	hand	computer
0.524	0.5239	0.529	0.5291
0.385	0.385461	0.471	0.470584
0.339	0.339180	0.441	0.441314
0.313	0.312962	0.417	0.417336
0.299	0.298620	0.402	0.402339
0.290	0.290274	0.384	0.383688
0.278	0.278238	0.368	0.368058
0.273	0.272698	0.345	0.345420
0.263	0.263524	0.322	0.322588
0.254	0.254197	0.299	0.299605
0.248	0.248248	0.277	0.276507

Appendix 4
(2 pages)

Column heads

Column 1)	2)	Explanation	Unit
A	ro(d)	ρ_d Dry density of sample	(kg dry/m ³)
B	index		
C	DT	ΔT Freezing point depression	(°C)
D	Wnf	w_{nf} Non frozen amount of water $w_{nf} = w_{es} - w_f$ w_{es} = evaporable amount of water w_f = frozen amount of water $w_f(\Delta T)$ from results of test with the microcalorimeter at LBM	(g H ₂ O/g dry)
E	ro(w)	ρ_w Density of water $\rho_w^*(\Delta T) = 1000 - 0.26 \cdot \Delta T$	(kg/m ³)
F	DH	$\Delta H(\Delta T)$ Molar heat of melting $\Delta H = M \cdot (333700 - 2000 \cdot \Delta T)$ $M = 18.015 \cdot 10^{-3}$	(J/mol·K) (kg/mol)
G	sigma	$\sigma_{lg}(\Delta T)$ Interfacial tension of the liquid/vapour interface $\sigma_{lg}(\Delta T) = 75,64 \cdot 10^{-3} \cdot (1 + 1,84 \cdot 10^{-3} \cdot \Delta T - 0,40 \cdot 10^{-6} \cdot (\Delta T)^2)$	(N/m)
H	rk	r_k Kelvinradius	(m)
$r_k = \frac{-2\sigma_{lg} \cdot M}{\rho_w \cdot \Delta H \cdot \ln\left(\frac{T_o - \Delta T}{T_o}\right)}$			
I	a	$\ln(1/\Delta T)$	
J	b	$e^{1/3 \cdot \ln(1/\Delta T)}$	
K	t	t Thickness of t-layer $t = 19.7 \cdot 10^{-10} \cdot \sqrt[3]{1/\Delta T}$	(m)
L	r	r Pore radius of circular cylindrical model pore $r = r_k + t$	(m)
M	M	$(\Delta V_p)_n / (r_{n-1} + r_n)$	(m ² /kg dry)

N	N	$\Sigma (\Delta V_p)_i / (r_{i-1} + r_i)$	(m ² /kg dry)
O	O	$t_{n-1} - t_n$	(nm)
P	P	$\left(\frac{r_{n-1} + r_n}{(r_k)_{n-1} + (r_k)_n} \right)^2$	
Q	Q	$(w_{nf})_{n-1} + (w_{nf})_n$	(g H ₂ O/g dry)
R	$D(V_p)_n$	$(\Delta V_p)_n \quad (\Delta V_p)_n = (Q * 1 / \rho_n - 4 * O * N) * P$	(m ³ /kg dry)
S	$SD(V_p)_n$	$\Sigma \Delta(V_p)_n \quad (\Sigma \Delta V_p)_n$	(m ³ /kg dry)
T	T	$\rho_d * (\Sigma \Delta V_p)_n$	(m ³ /m ³)
U	$r \text{ (nm)}$	$r * 10^9$	(nm)

1) Symbols in program PORESIZE

2) Symbols in text and in working sheet made by Jens Villadsen