

ID N° 22582 - Contact Angle Measurement - M4st

Executed on Mai 23, 2023, by M. Breitwieser

Pt-stab

****Platin auf Titan!**** vgl. Au auf Stahl

Screening-Sequenz. Start /Ende mit statischer Messung *** 15:01:00 #Charaterisierung Sequenz A.

 • **Platin / Isooktan 99.5+% :** (20,1°C, 10,1', 20mm, 0,0500mm/s - static; θ -superwetting)

 $\theta_{C,S} = 0 \pm 0^\circ$ CAH 0°, ${}^a\bar{E}_S = 19,947 \pm 0,050$ mN/m ${}^aH_S = -0,094$ mN/m, $\bar{B}_{\%,S} = 106,4\%$

Report

2. ===== Collection of Measurements in this Series Platin / Isooktan 99.5+% =====

Tabelle 1.2: Conditions and Results

N°	IDN° ...erData39	θ [°C]	$\Delta\tau$ [min]	\bar{v}_z [mm/s]	$\bar{C}a$ [1]	$t_{eq.}$ [s]	θ_M [°]	CAH [°]	aH [mN/m]	${}^a\bar{E}$ [mN/m]	$\pm\sigma$ [mN/m]	\bar{S} [m]/m ²	$\bar{B}_{\%,Isookta...}$ [%]
1.	22582₀	20,06	**0**	»0,0447«	-	3,12	<0>	<0>	-0,094	19,947	±0,050	1,21	106,4%
2.	22583 ₁	20,096	+29,5	10,0	2,64E-4	5,1	<90>	<-180>	81,07	20,5	±1,3	1,76	109,2%
3.	22584 ₂	20,11	+30,4	5,00	1,32E-4	5,8	<44>	<-88>	40,54	20,90	±0,65	2,16	111,5%
4.	22585 ₃	20,121	+31,4	2,50	6,61E-5	5,8	<53>	<-110>	51,98	21,08	±0,26	2,34	112,5%
5.	22586 ₄	20,123	+32,6	1,25	3,30E-5	5,1	<33>	<-66>	26,25	20,85	±0,18	2,11	111,2%
6.	22587 ₅	20,088	+35,2	0,625	1,65E-5	5,7	<20>	<-41>	13,087	20,775	±0,087	2,04	110,9%
7.	22588 ₆	20,01	+39,3	0,313	8,27E-6	6,0	<11>	<-21>	6,873	20,947	±0,056	2,21	111,7%
8.	22589 ₇	20,005	+42,5	0,156	4,13E-6	0,7	<0>	<0>	3,521	20,901	±0,048	2,16	111,5%
9.	22590 ₈	20,003	+48,0	<0,957>	2,53E-5	4,8	<27>	<-54>	21,423	21,84	±0,13	3,10	116,5%
10.	22591 ₉	19,996	+49,6	<0,710>	1,86E-5	0,1	<27>	<-54>	21,64	21,75	±0,20	3,01	116,0%
11.	22592 ₁₀	19,997	+51,4	<0,318>	8,44E-6	0,1	<0>	<0>	6,859	23,78	±0,42	5,04	126,8%
12.	22593 ₁₁	19,999	+54,5	<0,357>*	9,40E-6	0,1	<13>	<-26>	6,174	19,95	±0,16	1,21	106,4%
13.	22594 ₁₂	20	+57,6	<0,422>*	1,14E-5	0,1	<0>	<0>	1,697	22,02	±0,14	3,28	117,4%
14.	22595 ₁₃	19,995	+60,2	<0,392>*	1,05E-5	0,1	<0>	<0>	1,688	22,03	±0,14	3,29	117,5%
15.	22596 ₁₄	19,995	+62,9	<1,69>*	4,45E-5	0,0	<45>	<-89>	0,0	0,0	±0,0	-18,7	0,0%
16.	22597 ₁₅	20,003	+64,1	<1,93>*	5,10E-5	0,0	<34>	<-68>	35,7	24,8	±6,9	6,06	132,0%
17.	22598 ₁₆	19,999	+66,4	<2,55>*	6,73E-5	0,0	<34>	<-68>	36,5	24,9	±6,4	6,16	132,5%
18.	22599 ₁₇	20	+67,5	<4,43>*	1,16E-4	0,0	<24>	<-48>	37,67	31,1	±4,4	12,4	165,7%
19.	22600 ₁₈	20	+68,5	<6,70>	1,75E-4	4,9	<90>	<-180>	98,0	21,2	±3,9	2,46	113,1%
20.	22601 ₁₉	20	+69,4	»0,0453«	-	3,12	<0>	<0>	0,155	23,983	±0,031	5,24	127,9%
21.	22602 ₂₀	19,996	+87,3	»0,0448«	-	3,19	<0>	<0>	0,100	24,155	±0,037	5,42	128,8%

This table provides an overview of the measurements in this series. Each separate M4 measurement is referenced by IDN°. The highlighted row indicates the data set of the measurement documented below. The column labeled θ shows the measurement temperature, $\Delta\tau$ the time interval to previous/following measurements, \bar{v}_z the movement speed - where additional symbols clarify: »n« indicates static measurements, <n> represents distance-accelerated movement of the triple line, ** stands for continuous acceleration and a number without any symbol indicates a constant movement speed, $\bar{C}a$ is the capillary number, $t_{eq.}$ is the equilibration time before turnaround - but for static measurements the number denotes the average equilibration time as a levelling time between the measurement points, θ_M is the mean of the advancing and receding contact angle ('<n>' signs "errors"), contact angle hysteresis is given in degrees (CAH) and in energy units (aH), ${}^a\bar{E}$ is the mean adhesion energy, and $\pm\sigma$ is the corresponding standard deviation, \bar{S} is the mean of the spreading parameter, and $\bar{B}_{\%,Isookta...}$ indicates the relative wettability ($B_{\%,lq|sl|md...} = 100\% \cdot {}^aE/\gamma$).

 Tabelle 2.2: Summary of sample weights in the individual measurements (initial weight $W_0 = 14,0841$ g)

N°	W_A [g]	ΔW_{A-0} [mg]	W_E [g]	ΔW_{E-0} [mg]	V_{E-0} [µL]	ΔV_{E-A} [µL]
1.	14,0841	0,0	14,0932	9,1	13,2	13
2.	14,0931	9,0	14,0974	13,3	19,2	6,1
3.	14,0971	13,0	14,0946	10,5	15,2	-4,0
4.	14,0944	10,3	14,0928	8,7	12,6	-2,6
5.	14,0928	8,7	14,0936	9,5	13,7	1,2
6.	14,0914	7,3	14,0909	6,8	9,8	-3,9
7.	14,0909	6,8	14,0909	6,8	9,8	~0
8.	14,0909	6,8	14,0907	6,6	9,5	-0,29
9.	14,0906	6,5	14,0922	8,1	11,7	2,2
10.	14,0920	7,9	14,0915	7,4	10,7	-1,0
11.	14,0915	7,4	14,0912	7,1	10,3	-0,43
12.	14,0910	6,9	14,0910	6,9	10,0	-0,29
13.	14,0910	6,9	14,0922	8,1	11,7	1,7
14.	14,0920	7,9	14,0921	8,0	11,6	-0,14
15.	14,0920	7,9	14,0943	10,2	14,7	3,2
16.	14,0941	10,0	14,0946	10,5	15,2	0,43
17.	14,0944	10,3	14,0955	11,4	16,5	1,3
18.	14,0952	11,1	14,0975	13,4	19,4	2,9
19.	14,0972	13,1	14,0958	11,7	16,9	-2,5
20.	14,0957	11,6	14,0941	10,0	14,5	-2,5
21.	14,0941	10,0	14,0909	6,8	9,8	-4,6

Symbols: W_A : Total weight before each measurement, ΔW_{A-0} : Change in weight from the initial weight W_0 at the start of the series, W_E : Total weight after the measurement (possibly including the weight of any adherent fluid), ΔW_{E-0} : Change in weight from the initial weight W_0 at the start of the series, V_{E-0} : Weight change interpreted as fluid volume, ΔV_{E-A} : Fluid volume change calculated as the difference between W_E and W_A . (Automated weighings without contact to the surface of the fluid).

3. ===== Measurement IDN°22582: Static Contact Angle =====

Platin, cylindric Ø8,0mm

Contact Angle, CA θ_c	$<0 \pm 0^\circ>$	- superwetting -	
Contact Angle Hysteresis, CAH_s	$<0^\circ>$		
	Advancing $\theta_{A,s}$	Receding $\theta_{R,s}$	Transition - mm
Contact Angles, θ_s	0°	0°	$0^\circ_{adv.} \Rightarrow 0^\circ_{rec.}$
Rated measurements $n_{mm-range}$	42 7,000 - 15,200mm	53 19,801 - 11,200mm	2 20,001 - 19,951mm
avg. Triple line speed \bar{v}_z [mm/s]	0,0500 $\pm 0,0753$	-0,0394 $\pm 1,47$	
avg. Step distance $\bar{\Delta}h_0$ [mm]	0,200 $\pm 9,95E-05$	-0,178 $\pm 0,0536$	
avg. equilibration Time \bar{t}_{eq} [s]	3,11 $\pm 0,371$	3,12 $\pm 0,548$	

Static Contact Angle Measurement: For superwetting - consider adhesion parameters for analysis. The avg. equilibration Time t_{eq} is the mean of the time between positioning and acquiring the wetting force. The criterion of force equilibrium is defined in the utilized IMPro.

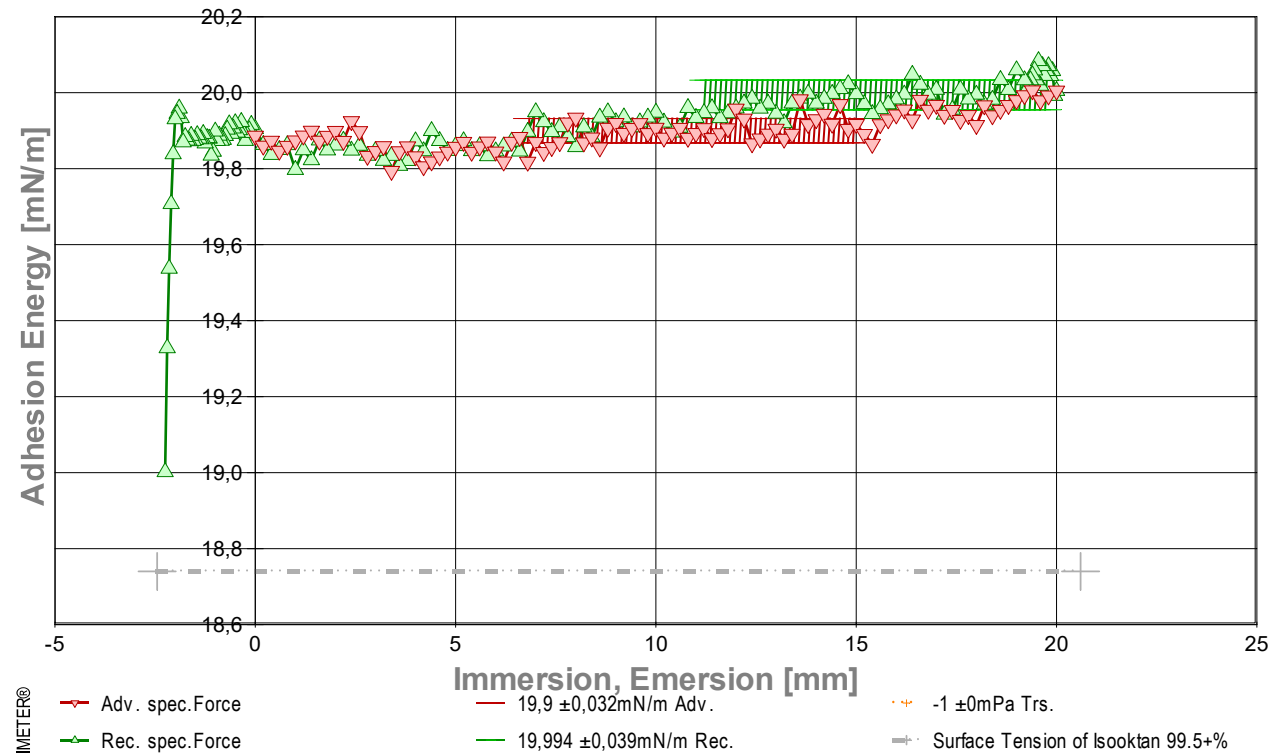
Adhesion Force of the equilibrated Triple Line

Energy of Adhesion, ${}^a\bar{E}_s = ({}^aE_A + {}^aE_R) / 2$	19,947 $\pm 0,050$ mN/m
Hysteresis, ${}^aH_s = {}^aE_A - {}^aE_R$	-0,094 mN/m
Parameter of spreading, $\bar{S}_s = {}^a\bar{E} - \gamma$	1,207 mJ/m ²
relative wettability, $\bar{B}_{\%s} = 100 \cdot {}^a\bar{E} / \gamma$	106,4% with Isooktan 99.5+%

	Advancing ${}^aE_{A,s}$	Receding ${}^aE_{R,s}$	Transition - mm
Energy of Adhesion, aE_s [mN/m]	19,9	19,994	19,992 $<adv.> \Rightarrow 20,057_{rec.}$
Standard deviation ${}^a\sigma$ [mN/m]	$\pm 0,032$	$\pm 0,039$	± 0
Linear regression, slope [mPa]	0	0	-1
correlation coefficient r^2	-	-	1,0
Relative wettability, $B_{\%s}$	106,2%	106,7%	

Data has left the region of measurable Contact Angles. resolving a kind of superwetting: ${}^aE_{A,R} > \gamma \cdot \cos\theta$ and wettability $B > 100\%$

- Diagramm 1.3: 'Triple-line Force²' static forces at the triple line, $\bar{v}_z=0,045$ mm/s



- Das Diagramm zeigt den Verlauf der Adhäsionsenergie aE entlang der Probenoberfläche. Den Messwerte werden bei unbewegtem Pegel des Fluids am Probekörper als statische Gleichgewichtszustände bestimmt. Die roten ∇ -Markierungen stehen für adv.-Messwerte (Eintauchen; von links nach rechts aufgezeichnet), grüne Δ -Markierungen gehören zu rec.-Werten (Rückzugsbewegung; von rechts nach links laufend). Die Oberflächenspannung von Isooktan 99.5+% ist als grau gestrichelte Horizontale bei 18,74 mN/m eingezeichnet; sie gibt die *maximale Zugfestigkeit* an, die eine flüssige Isooktan 99.5+%-Oberfläche aushalten kann. Aber, die Adhäsionsenergie zwischen Isooktan 99.5+% und Platin übersteigt die Oberflächenspannung. Diese *Überbenetzung (Superwetting)* ist gekennzeichnet durch die *Kontaktwinkelproblematik*, da tatsächlich $\cos(\theta) > 1$ eintritt. Falls andere Störeinflüsse (ggf. elektrostatische, rheologische) auszuschließen sind, kommen Grenzschicht- und/oder tribologische Effekte in Betracht, die den lokalen Wert der Oberflächenspannung raumgreifend - oder den Wert einer ungeklärten Zusatzkraft an der *Triple Line* - vergrößern und das Geschehen verändern könnten.

4. ===== Details on the Measurement and Setup =====

Sample: 'Platin', **Form:** cylindric, diameter 8,0 mm.

Test Liquid: 'Isooktan 99.5+%' at 20,06°C: density 0,691859 g/mL, surface tension 18,74 mN/m, viscosity 0,4956 mPa·s; Capillary length 1,66 mm.

Suspension/Fixation: by operator.

Vessel: tempered double wall measuring cell, height 140 mm, inclosing sample and liquid at coherent temperature and atmosphere; Surface area ∞ by CLT. - The 'CLT' Constant-Level-Technic prevents rising/falling of the Isooktan 99.5+%-level in the vessel (surface 1452mm²) through immersion/emersion of the sample volume in the vessel by appropriate pumping of Isooktan 99.5+%.

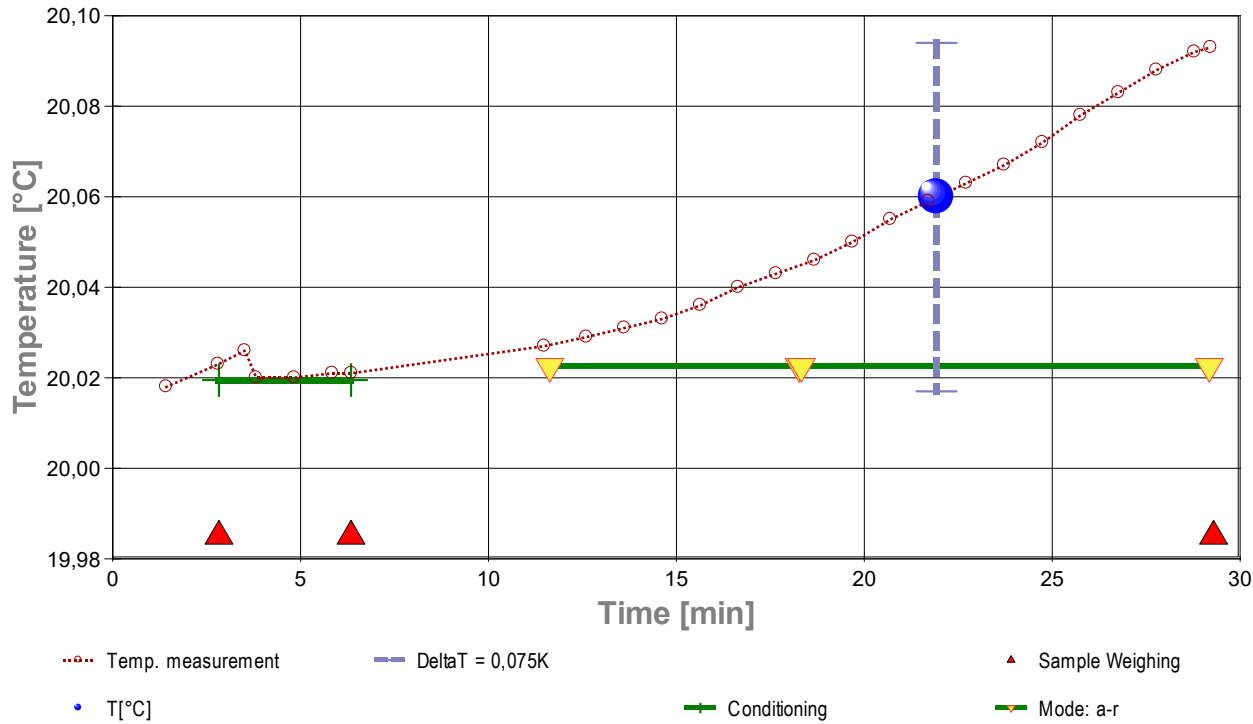
Conditioning: during 3,2 min in the measuring cell above the surface of the liquid.

Sample Weight: at start 14,0840 g, after conditioning 14,0841 g, after the measurement 14,0932 g.

Gain in weight during conditioning 0,0001 g (+9,9 ppm) and after measurement 0,0092 g (+0,66‰).

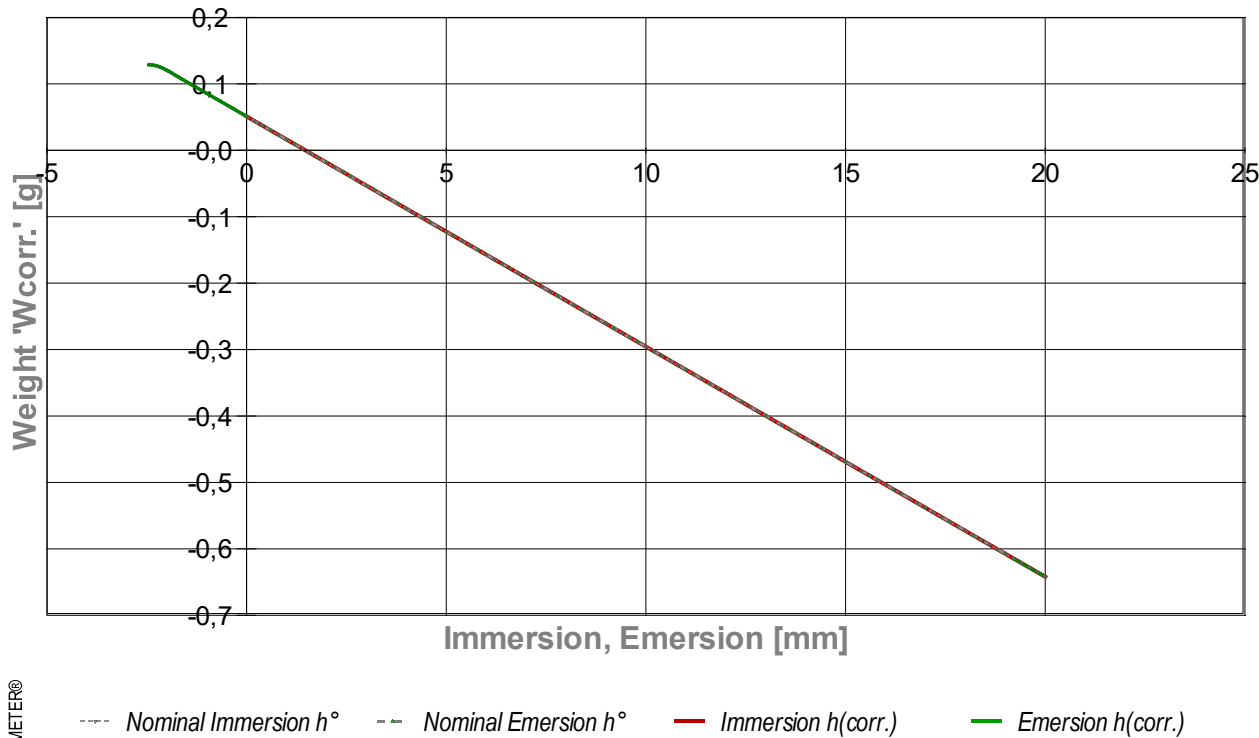
Measurement algorithm: static CA-measurement, acquisition of equilibrated values, stepwise movement. Maximum immersion of 20,001 mm and force equilibration at the inflection point for 3,5 s. Duration for immersion 6,6 min, for emersion 3,5 min.

Time & Temperature: 30 Minuten; Temperaturzunahme von 20,02 auf 20,09°C. - Diagramm 2.4: 'Temperature & Events²' -- Survey on Temperature and Time



- Das Diagramm "Temperature & Events²" dokumentiert neben der Flüssigkeitstemperatur der Messfluids (Isooktan 99,5+%) die zeitliche Abfolge der Verfahrensschritte. Die Temperaturmesswerte sind als kleine Kreise abgebildet; die kugelförmige Marke gibt die der Messung insgesamt zugeordnete Temperatur an (20,06°C). Markierungen auf der horizontalen grünen Linie bilden das Zeitintervall der Konditionierung ab, das auf das Einsetzen der Probe folgt. Weitere gelbe Dreiecke auf der grünen Horizontalen bezeichnen die Schaltung jeweiliger Messmodi ('a-r' bedeutet *Advancing*- und *Receding*-Bewegung). Die roten Dreiecke, unten im Diagramm, markieren die Zeitpunkte der Probenwägung von Platin (ohne Kontakt zur Fluidoberfläche).

- Diagramm 3.4: 'RawData²' -- Acquired weights during immersion and emersion (raw data and immersion corrected lengths)



- Im Diagramm "RawData²" werden die Wägewerte zur statischen Kontaktwinkelmessung gegen die Eintauchtiefe der Probe abgebildet. Von den Roh-Wägewerten W_{RAW} wurden Proben- und Aufhängungsgewichte subtrahiert, so dass hier die Gewichte der Benetzungs- und Auftriebskräfte abgebildet werden ($W_{corr.}$). Die Kurvenverläufe fallen mit der Eintauchtiefe h (*immersion depth*) ab, indes der Volumenauftrieb des eintauchenden Probekörpers zunimmt. Im Diagramm sind Wägewerte für die advancing- und receding-Bewegung eingetragen, sowohl für nominelle (h_0) und für korrigierte Eintauchtiefen ($h_{corr.}$). Die roten Dreiecke bezeichnen die Messwerte bei $h_{corr.}$ bei der Vorwärtsbewegung (adv.), die grünen Dreiecke gehören zu Auszugsbewegungen (rec.). Durch 'CLT' (die *Constant-Level-Technic*) wird die Pegelveränderung besonders durch das ein- und austauchendes Probenvolumen simultan kompensiert, sodass die nominelle Eintauchtief mit der tatsächlichen identisch ist; die Kurven sind deshalb praktisch deckungsgleich. Weiterhin zeigt das Diagramm noch Werte zu *negativen Eintauchtiefen*. Diese Wertepaare gehören der *Kapillarbrücke* ($cb = capillary\ bridge$) an, die sich beim Herausziehen der Probe über das Flüssigkeitsniveau deutlich ausbilden kann; besonders, wenn das Probenende scharfkantig ist.

5. ===== Table of raw data and results =====

The table below provides the data for each contact angle measuring position in this experiment ($n=259$). - Within a row the column t lists the time of the CA-measurement. $t_{eq.}$ is the duration reach the equilibrated force after positioning (static measurement). The nominal distance between the sample bottom flatface and the liquid surface is given by h_0 , whilst $h_{corr.}$ shows the corrected immersion depth- *due to CLT the values are the same*. With W_{RAW} the stabilized total weight of the sample, sample holder, wetting force and buoyancy is written. The $W_{corr.}$ -values* are former weighing values when the weight of the sample and its holder is subtracted. After buoyancy- correction, aF is the force exerted on the triple line. The Energy of Adhesion ${}^aE_{A,R} = {}^aF/p$ is the force of adhesion per meter of the circumference (p) of the sample. θ is the Contact Angle. The last column indicates by **chr** the advancing resp. receding state; **cb** tags values of a 'capillary bridge' above the surface-level.

(Resolving static force of wetting from ${}^aF = (W_{raw}-W_0-W_{Buoy.})\cdot g + F_{Buoy.air}$) * $W_{corr.} = W_{raw}-W_0$ (with $W_0=14,0841$ g).

Table 3.5: Data table

N°	t [min]	$t_{eq.}$ [sec]	h_0 [mm]	$h_{corr.}$ [mm]	W_{RAW} [g]	$W_{corr.}$ [g]	aF [mN]	${}^aE_{A,R}$ [mN/m]	θ [°deg]	chr
1.	0,00	2,8	0,000	0,000	14,1351	0,0510	0,4998	19,89	0	a
2.	0,06	3,1	0,200	0,200	14,1281	0,0440	0,4991	19,86	0	a
3.	0,13	3,0	0,400	0,400	14,1212	0,0371	0,4995	19,87	0	a
4.	0,19	3,0	0,600	0,600	14,1142	0,0301	0,4988	19,85	0	a
5.	0,25	3,0	0,800	0,800	14,1073	0,0232	0,4991	19,86	0	a
6.	0,32	2,9	1,000	1,000	14,1004	0,0163	0,4995	19,87	0	a
7.	0,38	3,0	1,200	1,200	14,0935	0,0094	0,4998	19,89	0	a
8.	0,44	3,0	1,400	1,400	14,0866	0,0025	0,5001	19,90	0	a
9.	0,51	2,9	1,600	1,600	14,0796	-0,0045	0,4995	19,87	0	a
10.	0,57	3,9	1,800	1,800	14,0727	-0,0114	0,4998	19,89	0	a
11.	0,65	2,9	2,000	2,000	14,0658	-0,0183	0,5001	19,90	0	a
12.	0,71	3,0	2,200	2,200	14,0588	-0,0253	0,4995	19,87	0	a
13.	0,77	2,9	2,400	2,400	14,0520	-0,0321	0,5008	19,92	0	a
14.	0,84	2,9	2,600	2,600	14,0450	-0,0391	0,5001	19,90	0	a
15.	0,90	3,0	2,800	2,800	14,0379	-0,0462	0,4985	19,83	0	a
16.	0,96	3,0	3,000	3,000	14,0310	-0,0531	0,4988	19,85	0	a
17.	1,04	2,9	3,200	3,200	14,0241	-0,0600	0,4991	19,86	0	a
18.	1,11	2,9	3,400	3,400	14,0170	-0,0671	0,4975	19,79	0	a
19.	1,17	2,9	3,600	3,600	14,0102	-0,0739	0,4988	19,85	0	a
20.	1,23	2,9	3,800	3,800	14,0033	-0,0808	0,4991	19,86	0	a
21.	1,29	3,1	4,000	4,000	13,9963	-0,0878	0,4984	19,83	0	a
22.	1,36	3,0	4,200	4,200	13,9893	-0,0948	0,4978	19,81	0	a
23.	1,42	3,0	4,400	4,400	13,9824	-0,1017	0,4981	19,82	0	a
24.	1,49	3,0	4,600	4,600	13,9755	-0,1086	0,4984	19,83	0	a
25.	1,56	3,1	4,800	4,800	13,9686	-0,1155	0,4987	19,84	0	a
26.	1,63	3,0	5,000	5,000	13,9617	-0,1224	0,4991	19,86	0	a
27.	1,69	2,9	5,200	5,200	13,9548	-0,1293	0,4994	19,87	0	a
28.	1,75	3,4	5,400	5,400	13,9478	-0,1363	0,4987	19,84	0	a
29.	1,82	2,9	5,600	5,600	13,9409	-0,1432	0,4991	19,86	0	a
30.	1,89	3,0	5,800	5,800	13,9340	-0,1501	0,4994	19,87	0	a
31.	1,95	3,0	6,000	6,000	13,9270	-0,1571	0,4988	19,84	0	a
32.	2,02	3,0	6,200	6,200	13,9200	-0,1641	0,4981	19,82	0	a
33.	2,08	3,1	6,400	6,400	13,9132	-0,1709	0,4994	19,87	0	a
34.	2,14	3,0	6,600	6,600	13,9063	-0,1778	0,4997	19,88	0	a
35.	2,21	3,0	6,800	6,800	13,8992	-0,1849	0,4981	19,82	0	a
36.	2,27	2,9	7,000	7,000	13,8924	-0,1917	0,4994	19,87	0	a
37.	2,33	3,0	7,200	7,200	13,8854	-0,1987	0,4987	19,84	0	a
38.	2,40	3,0	7,400	7,400	13,8785	-0,2056	0,4990	19,86	0	a
39.	2,46	3,4	7,600	7,600	13,8716	-0,2125	0,4994	19,87	0	a
40.	2,53	3,0	7,800	7,800	13,8648	-0,2193	0,5007	19,92	0	a
41.	2,60	2,9	8,000	8,000	13,8579	-0,2262	0,5010	19,93	0	a
42.	2,66	3,0	8,200	8,200	13,8508	-0,2333	0,4994	19,87	0	a
43.	2,72	3,4	8,400	8,400	13,8439	-0,2402	0,4997	19,88	0	a
44.	2,80	2,9	8,600	8,600	13,8369	-0,2472	0,4990	19,86	0	a
45.	2,86	3,0	8,800	8,800	13,8301	-0,2540	0,5003	19,91	0	a
46.	2,92	3,1	9,000	9,000	13,8232	-0,2609	0,5006	19,92	0	a
47.	2,99	3,0	9,200	9,200	13,8162	-0,2679	0,5000	19,89	0	a
48.	3,06	2,9	9,400	9,400	13,8093	-0,2748	0,5003	19,91	0	a
49.	3,13	3,0	9,600	9,600	13,8024	-0,2817	0,5006	19,92	0	a
50.	3,19	3,9	9,800	9,800	13,7954	-0,2887	0,5000	19,89	0	a
51.	3,27	3,0	10,000	10,000	13,7885	-0,2956	0,5003	19,91	0	a
52.	3,33	3,0	10,200	10,200	13,7815	-0,3026	0,4997	19,88	0	a
53.	3,39	3,0	10,400	10,400	13,7746	-0,3095	0,5000	19,89	0	a
54.	3,46	3,0	10,600	10,600	13,7677	-0,3164	0,5003	19,91	0	a
55.	3,52	2,9	10,800	10,800	13,7607	-0,3234	0,4997	19,88	0	a
56.	3,58	2,9	11,000	11,000	13,7538	-0,3303	0,5000	19,89	0	a
57.	3,65	2,9	11,200	11,200	13,7469	-0,3372	0,5003	19,91	0	a
58.	3,71	3,0	11,400	11,400	13,7399	-0,3442	0,4996	19,88	0	a
59.	3,77	3,0	11,600	11,600	13,7330	-0,3511	0,5000	19,89	0	a
60.	3,84	2,9	11,800	11,800	13,7261	-0,3580	0,5003	19,91	0	a
61.	3,90	4,9	12,000	12,000	13,7193	-0,3648	0,5016	19,96	0	a
62.	3,99	3,9	12,200	12,200	13,7123	-0,3718	0,5009	19,93	0	a
63.	4,08	2,9	12,400	12,400	13,7052	-0,3789	0,4993	19,87	0	a
64.	4,14	3,0	12,600	12,600	13,6983	-0,3858	0,4996	19,88	0	a
65.	4,20	3,0	12,800	12,800	13,6914	-0,3927	0,4999	19,89	0	a
66.	4,26	3,0	13,000	13,000	13,6845	-0,3996	0,5003	19,90	0	a
67.	4,33	3,0	13,200	13,200	13,6775	-0,4066	0,4996	19,88	0	a
68.	4,39	3,0	13,400	13,400	13,6706	-0,4135	0,4999	19,89	0	a
69.	4,46	3,0	13,600	13,600	13,6639	-0,4202	0,5022	19,98	0	a
70.	4,52	3,5	13,800	13,800	13,6568	-0,4273	0,5006	19,92	0	a
71.	4,59	3,0	14,000	14,000	13,6499	-0,4342	0,5009	19,93	0	a
72.	4,66	4,9	14,200	14,200	13,6430	-0,4411	0,5012	19,94	0	a
73.	4,75	3,9	14,400	14,400	13,6360	-0,4481	0,5006	19,92	0	a
74.	4,83	3,4	14,600	14,600	13,6292	-0,4549	0,5019	19,97	0	a
75.	4,90	3,0	14,800	14,800	13,6221	-0,4620	0,5003	19,90	0	a
76.	4,97	2,9	15,000	15,000	13,6152	-0,4689	0,5006	19,92	0	a
77.	5,03	3,7	15,200	15,200	13,6082	-0,4759	0,4999	19,89	0	a
78.	5,11	3,0	15,400	15,400	13,6012	-0,4829	0,4993	19,86	0	a
79.	5,17	2,9	15,600	15,600	13,5944	-0,4897	0,5006	19,92	0	a
80.	5,24	3,4	15,800	15,800	13,5875	-0,4966	0,5009	19,93	0	a
81.	5,31	3,0	16,000	16,000	13,5806	-0,5035	0,5012	19,94	0	a
82.	5,37	3,0	16,200	16,200	13,5737	-0,5104	0,5015	19,96	0	a
83.	5,44	3,0	16,400	16,400	13,5667	-0,5174	0,5009	19,93	0	a
84.	5,50	3,9	16,600	16,600	13,5599	-0,5242	0,5022	19,98	0	a
85.	5,58	4,0	16,800	16,800	13,5529	-0,5312	0,5015	19,95	0	a
86.	5,66	3,0	17,000	17,000	13,5460	-0,5381	0,5018	19,97	0	a

87.	5,72	3,0	17,200	17,200	13,5390	-0,5451	0,5012	19,94	0	a
88.	5,79	2,9	17,400	17,400	13,5321	-0,5520	0,5015	19,95	0	a
89.	5,85	3,0	17,600	17,600	13,5251	-0,5590	0,5008	19,93	0	a
90.	5,91	3,0	17,800	17,800	13,5182	-0,5659	0,5012	19,94	0	a
91.	5,98	2,9	18,000	18,000	13,5112	-0,5729	0,5005	19,91	0	a
92.	6,04	3,5	18,200	18,200	13,5044	-0,5797	0,5018	19,97	0	a
93.	6,11	2,9	18,400	18,400	13,4974	-0,5867	0,5011	19,94	0	a
94.	6,17	3,9	18,601	18,601	13,4905	-0,5936	0,5015	19,95	0	a
95.	6,25	3,0	18,801	18,801	13,4836	-0,6005	0,5018	19,97	0	a
96.	6,32	3,0	19,001	19,001	13,4767	-0,6074	0,5022	19,98	0	a
97.	6,38	2,9	19,201	19,201	13,4698	-0,6143	0,5025	19,99	0	a
98.	6,44	3,0	19,401	19,401	13,4629	-0,6212	0,5028	20,01	0	a
99.	6,51	3,0	19,601	19,601	13,4559	-0,6282	0,5021	19,98	0	a
100.	6,57	3,0	19,801	19,801	13,4490	-0,6351	0,5025	19,99	0	a
101.	6,63	2,9	20,001	20,001	13,4421	-0,6420	0,5028	20,01	0	a
102.	6,69	3,0	19,951	19,951	13,4438	-0,6403	0,5025	19,99	0	r
103.	6,75	3,0	19,901	19,901	13,4457	-0,6384	0,5041	20,06	0	r
104.	6,81	3,0	19,851	19,851	13,4474	-0,6367	0,5038	20,04	0	r
105.	6,87	3,0	19,801	19,801	13,4492	-0,6349	0,5044	20,07	0	r
106.	6,93	3,0	19,751	19,751	13,4509	-0,6332	0,5041	20,06	0	r
107.	6,99	3,4	19,701	19,701	13,4526	-0,6315	0,5038	20,04	0	r
108.	7,05	3,8	19,651	19,651	13,4544	-0,6297	0,5044	20,07	0	r
109.	7,13	2,9	19,601	19,601	13,4560	-0,6281	0,5031	20,02	0	r
110.	7,19	3,0	19,551	19,551	13,4579	-0,6262	0,5048	20,08	0	r
111.	7,25	3,1	19,501	19,501	13,4595	-0,6246	0,5035	20,03	0	r
112.	7,31	3,0	19,451	19,451	13,4613	-0,6228	0,5041	20,06	0	r
113.	7,37	3,0	19,401	19,401	13,4630	-0,6211	0,5038	20,05	0	r
114.	7,43	3,0	19,351	19,351	13,4647	-0,6194	0,5035	20,03	0	r
115.	7,48	3,0	19,301	19,301	13,4664	-0,6177	0,5032	20,02	0	r
116.	7,54	3,0	19,251	19,251	13,4681	-0,6160	0,5028	20,01	0	r
117.	7,60	3,0	19,201	19,201	13,4699	-0,6142	0,5035	20,03	0	r
118.	7,66	3,0	19,001	19,001	13,4769	-0,6072	0,5041	20,06	0	r
119.	7,73	3,2	18,801	18,801	13,4837	-0,6004	0,5028	20,01	0	r
120.	7,80	3,0	18,601	18,601	13,4907	-0,5934	0,5035	20,03	0	r
121.	7,86	3,0	18,401	18,401	13,4975	-0,5866	0,5022	19,98	0	r
122.	7,92	2,9	18,201	18,201	13,5044	-0,5797	0,5019	19,97	0	r
123.	7,99	2,9	18,001	18,001	13,5114	-0,5727	0,5025	20,00	0	r
124.	8,05	3,0	17,801	17,801	13,5183	-0,5658	0,5022	19,98	0	r
125.	8,13	3,0	17,601	17,601	13,5253	-0,5588	0,5029	20,01	0	r
126.	8,19	2,9	17,401	17,401	13,5321	-0,5520	0,5015	19,96	0	r
127.	8,26	3,0	17,201	17,201	13,5390	-0,5451	0,5012	19,94	0	r
128.	8,32	2,9	17,001	17,001	13,5461	-0,5380	0,5029	20,01	0	r
129.	8,38	3,0	16,801	16,801	13,5530	-0,5311	0,5025	19,99	0	r
130.	8,45	2,9	16,601	16,601	13,5600	-0,5241	0,5032	20,02	0	r
131.	8,51	3,0	16,401	16,401	13,5670	-0,5171	0,5038	20,05	0	r
132.	8,58	3,1	16,201	16,201	13,5738	-0,5103	0,5025	20,00	0	r
133.	8,64	4,0	16,001	16,001	13,5807	-0,5034	0,5022	19,98	0	r
134.	8,72	3,1	15,801	15,801	13,5876	-0,4965	0,5019	19,97	0	r
135.	8,79	3,0	15,601	15,601	13,5945	-0,4896	0,5016	19,96	0	r
136.	8,85	2,9	15,401	15,401	13,6014	-0,4827	0,5013	19,94	0	r
137.	8,91	3,0	15,201	15,201	13,6084	-0,4757	0,5019	19,97	0	r
138.	8,98	2,9	15,001	15,001	13,6154	-0,4687	0,5026	20,00	0	r
139.	9,04	4,5	14,801	14,801	13,6224	-0,4617	0,5032	20,02	0	r
140.	9,14	2,9	14,601	14,601	13,6293	-0,4548	0,5029	20,01	0	r
141.	9,21	2,9	14,401	14,401	13,6362	-0,4479	0,5026	20,00	0	r
142.	9,27	2,9	14,201	14,201	13,6431	-0,4410	0,5023	19,98	0	r
143.	9,33	3,0	14,001	14,001	13,6500	-0,4341	0,5019	19,97	0	r
144.	9,40	3,0	13,801	13,801	13,6570	-0,4271	0,5026	20,00	0	r
145.	9,46	2,9	13,601	13,601	13,6639	-0,4202	0,5023	19,98	0	r
146.	9,52	3,0	13,401	13,401	13,6708	-0,4133	0,5020	19,97	0	r
147.	9,58	2,9	13,201	13,201	13,6776	-0,4065	0,5006	19,92	0	r
148.	9,65	3,0	13,000	13,000	13,6846	-0,3995	0,5013	19,95	0	r
149.	9,71	2,7	12,800	12,800	13,6916	-0,3925	0,5019	19,97	0	r
150.	9,77	3,7	12,600	12,600	13,6985	-0,3856	0,5016	19,96	0	r
151.	9,85	4,8	12,400	12,400	13,7055	-0,3786	0,5023	19,98	0	r
152.	9,94	3,1	12,200	12,200	13,7124	-0,3717	0,5019	19,97	0	r
153.	10,01	3,0	12,000	12,000	13,7193	-0,3648	0,5016	19,96	0	r
154.	10,07	3,0	11,800	11,800	13,7262	-0,3579	0,5013	19,95	0	r
155.	10,15	2,9	11,600	11,600	13,7331	-0,3510	0,5010	19,93	0	r
156.	10,21	3,0	11,400	11,400	13,7401	-0,3440	0,5016	19,96	0	r
157.	10,27	2,9	11,200	11,200	13,7470	-0,3371	0,5013	19,95	0	r
158.	10,33	2,9	11,000	11,000	13,7539	-0,3302	0,5010	19,93	0	r
159.	10,40	3,0	10,800	10,800	13,7609	-0,3232	0,5017	19,96	0	r
160.	10,46	3,3	10,600	10,600	13,7677	-0,3164	0,5003	19,91	0	r
161.	10,53	2,9	10,400	10,400	13,7746	-0,3095	0,5000	19,90	0	r
162.	10,59	2,9	10,200	10,200	13,7816	-0,3025	0,5007	19,92	0	r
163.	10,65	2,9	10,000	10,000	13,7886	-0,2955	0,5013	19,95	0	r
164.	10,71	2,9	9,800	9,800	13,7955	-0,2886	0,5010	19,93	0	r
165.	10,78	2,9	9,600	9,600	13,8024	-0,2817	0,5007	19,92	0	r
166.	10,84	3,0	9,400	9,400	13,8093	-0,2748	0,5004	19,91	0	r
167.	10,90	2,9	9,200	9,200	13,8163	-0,2678	0,5010	19,94	0	r
168.	10,96	2,9	9,000	9,000	13,8232	-0,2609	0,5007	19,92	0	r
169.	11,03	2,9	8,800	8,800	13,8302	-0,2539	0,5014	19,95	0	r
170.	11,09	3,4	8,600	8,600	13,8371	-0,2470	0,5010	19,93	0	r
171.	11,16	3,0	8,400	8,400	13,8439	-0,2402	0,4997	19,88	0	r
172.	11,23	3,1	8,200	8,200	13,8509	-0,2332	0,5004	19,91	0	r
173.	11,29	3,0	8,000	8,000	13,8577	-0,2264	0,4991	19,86	0	r
174.	11,35	5,3	7,800	7,800	13,8647	-0,2194	0,4997	19,88	0	r
175.	11,46	2,9	7,600	7,600	13,8717	-0,2124	0,5004	19,91	0	r
176.	11,52	3,0	7,400	7,400	13,8786	-0,2055	0,5001	19,90	0	r
177.	11,58	2,9	7,200	7,200	13,8856	-0,1985	0,5007	19,92	0	r
178.	11,64	2,8	7,000	7,000	13,8926	-0,1915	0,5014	19,95	0	r
179.	11,71	3,0	6,800	6,800	13,8994	-0,1847	0,5001	19,90	0	r
180.	11,77	3,0	6,600	6,600	13,9062	-0,1779	0,4988	19,85	0	r
181.	11,83	2,9	6,400	6,400	13,9132	-0,1709	0,4994	19,87	0	r
182.	11,89	2,9	6,200	6,200	13,9201	-0,1640	0,4991	19,86	0	r
183.	11,96	7,3	6,000	6,000	13,9270	-0,1571	0,4988	19,85	0	r
184.	12,09	3,0	5,800	5,800	13,9339	-0,1502	0,4985	19,83	0	r
185.	12,17	2,9	5,600	5,600	13,9409	-0,1432	0,4991	19,86	0	r
186.	12,24	2,9	5,400	5,400	13,9478	-0,1363	0,4988	19,85	0	r
187.	12,30	3,0	5,200	5,200	13,9548	-0,1293	0,4995	19,87	0	r
188.	12,36	3,0	5,000	5,000	13,9617	-0,1224	0,4991	19,86	0	r
189.	12,42	2,9	4,800	4,800	13,9686	-0,1155	0,4988	19,85	0	r

190.	12,48	2,9	4,600	4,600	13,9756	-0,1085	0,4995	19,87	0	r
191.	12,55	2,9	4,400	4,400	13,9826	-0,1015	0,5001	19,90	0	r
192.	12,61	3,0	4,200	4,200	13,9894	-0,0947	0,4988	19,85	0	r
193.	12,67	3,0	4,000	4,000	13,9964	-0,0877	0,4994	19,87	0	r
194.	12,74	3,0	3,800	3,800	14,0032	-0,0809	0,4981	19,82	0	r
195.	12,80	3,1	3,600	3,600	14,0101	-0,0740	0,4978	19,81	0	r
196.	12,87	3,4	3,400	3,400	14,0171	-0,0670	0,4985	19,83	0	r
197.	12,94	3,9	3,200	3,200	14,0240	-0,0601	0,4982	19,82	0	r
198.	13,02	3,0	3,000	3,000	14,0310	-0,0531	0,4988	19,85	0	r
199.	13,08	2,9	2,800	2,800	14,0379	-0,0462	0,4985	19,83	0	r
200.	13,14	3,2	2,600	2,600	14,0449	-0,0392	0,4992	19,86	0	r
201.	13,21	3,0	2,400	2,400	14,0518	-0,0323	0,4988	19,85	0	r
202.	13,27	2,9	2,200	2,200	14,0588	-0,0253	0,4995	19,87	0	r
203.	13,34	2,9	2,000	2,000	14,0657	-0,0184	0,4992	19,86	0	r
204.	13,40	2,9	1,800	1,800	14,0726	-0,0115	0,4988	19,85	0	r
205.	13,46	2,9	1,600	1,600	14,0796	-0,0045	0,4995	19,87	0	r
206.	13,52	3,8	1,400	1,400	14,0864	0,0023	0,4982	19,82	0	r
207.	13,60	3,9	1,200	1,200	14,0934	0,0093	0,4989	19,85	0	r
208.	13,68	2,9	1,000	1,000	14,1002	0,0161	0,4976	19,80	0	r
209.	13,74	2,9	0,800	0,800	14,1073	0,0232	0,4992	19,86	0	r
210.	13,80	3,0	0,600	0,600	14,1142	0,0301	0,4989	19,85	0	r
211.	13,87	3,0	0,400	0,400	14,1211	0,0370	0,4986	19,84	0	r
212.	13,93	2,9	0,200	0,200	14,1281	0,0440	0,4992	19,86	0	r
213.	13,99	3,6	0,000	0,000	14,1351	0,0510	0,5003	19,90	0	r
214.	14,06	3,6	-0,050	-0,050	14,1368	0,0527	0,4999	19,89	0	cb
215.	14,14	4,4	-0,100	-0,100	14,1386	0,0545	0,5005	19,92	0	cb
216.	14,22	3,7	-0,150	-0,150	14,1403	0,0562	0,5002	19,90	0	cb
217.	14,30	3,6	-0,200	-0,200	14,1420	0,0579	0,4998	19,89	0	cb
218.	14,37	3,6	-0,250	-0,250	14,1437	0,0596	0,4995	19,87	0	cb
219.	14,45	3,7	-0,300	-0,300	14,1455	0,0614	0,5000	19,89	0	cb
220.	14,52	3,6	-0,350	-0,350	14,1473	0,0632	0,5007	19,92	0	cb
221.	14,60	3,6	-0,400	-0,400	14,1490	0,0649	0,5002	19,90	0	cb
222.	14,67	3,7	-0,450	-0,450	14,1507	0,0666	0,5000	19,90	0	cb
223.	14,75	3,6	-0,500	-0,500	14,1525	0,0684	0,5007	19,92	0	cb
224.	14,82	3,6	-0,550	-0,550	14,1542	0,0701	0,5003	19,91	0	cb
225.	14,89	3,5	-0,600	-0,600	14,1559	0,0718	0,4999	19,89	0	cb
226.	14,96	3,6	-0,650	-0,650	14,1577	0,0736	0,5006	19,92	0	cb
227.	15,04	3,6	-0,700	-0,700	14,1594	0,0753	0,5002	19,90	0	cb
228.	15,11	3,6	-0,750	-0,750	14,1611	0,0770	0,4998	19,89	0	cb
229.	15,20	3,6	-0,800	-0,800	14,1628	0,0787	0,4995	19,88	0	cb
230.	15,28	3,6	-0,850	-0,850	14,1645	0,0804	0,4995	19,87	0	cb
231.	15,35	3,6	-0,900	-0,900	14,1663	0,0822	0,4998	19,89	0	cb
232.	15,42	3,6	-0,950	-0,950	14,1680	0,0839	0,4995	19,87	0	cb
233.	15,50	3,6	-1,000	-1,000	14,1698	0,0857	0,5001	19,90	0	cb
234.	15,57	3,7	-1,050	-1,050	14,1714	0,0873	0,4988	19,84	0	cb
235.	15,65	3,7	-1,100	-1,100	14,1731	0,0890	0,4985	19,83	0	cb
236.	15,72	3,6	-1,150	-1,150	14,1750	0,0909	0,4996	19,88	0	cb
237.	15,80	3,6	-1,200	-1,200	14,1767	0,0926	0,4997	19,88	0	cb
238.	15,87	3,6	-1,250	-1,250	14,1784	0,0943	0,4993	19,87	0	cb
239.	15,94	3,7	-1,300	-1,300	14,1802	0,0961	0,4999	19,89	0	cb
240.	16,02	3,6	-1,350	-1,350	14,1819	0,0978	0,4996	19,88	0	cb
241.	16,09	3,6	-1,400	-1,400	14,1836	0,0995	0,4996	19,88	0	cb
242.	16,16	4,5	-1,450	-1,450	14,1854	0,1013	0,4999	19,89	0	cb
243.	16,25	3,6	-1,500	-1,500	14,1871	0,1030	0,4995	19,88	0	cb
244.	16,32	3,6	-1,550	-1,550	14,1888	0,1047	0,4995	19,87	0	cb
245.	16,40	3,6	-1,600	-1,600	14,1906	0,1065	0,4998	19,89	0	cb
246.	16,47	3,6	-1,650	-1,650	14,1923	0,1082	0,4995	19,87	0	cb
247.	16,55	3,6	-1,700	-1,700	14,1940	0,1099	0,4995	19,87	0	cb
248.	16,62	3,6	-1,750	-1,750	14,1958	0,1117	0,4997	19,88	0	cb
249.	16,69	3,6	-1,800	-1,800	14,1975	0,1134	0,4994	19,87	0	cb
250.	16,76	3,6	-1,850	-1,850	14,1994	0,1153	0,5010	19,93	0	cb
251.	16,84	3,6	-1,900	-1,900	14,2012	0,1171	0,5016	19,96	0	cb
252.	16,91	3,6	-1,950	-1,950	14,2029	0,1188	0,5013	19,94	0	cb
253.	16,98	3,7	-2,000	-2,000	14,2046	0,1205	0,5009	19,93	0	cb
254.	17,06	3,6	-2,050	-2,050	14,2061	0,1220	0,4986	19,84	0	cb
255.	17,13	3,6	-2,100	-2,100	14,2075	0,1234	0,4953	19,71	0	cb
256.	17,22	2,1	-2,150	-2,150	14,2088	0,1247	0,4910	19,54	0	cb
257.	17,27	3,6	-2,200	-2,200	14,2100	0,1259	0,4858	19,33	0	cb
258.	17,34	3,6	-2,250	-2,250	14,2109	0,1268	0,4776	19,00	0	cb
259.	17,42	3,7	-2,300	-2,300	14,2117	0,1276	0,4684	-	6,03	cb

Meldungen

Die Rückzugs- bzw. Receding- Bewegung ist aus 3 Zügen zusammengesetzt.

Temperaturangaben beziehen sich auf die Skala der ITS-90. **Standardabweichungen:** Verschiedentlich werden Regressionsfunktionen mit Standardabweichungen bzw. Varianzen qualifiziert. Diese Angaben werden berechnet aus der Summe der Quadrate der Abweichungen der Einzelwerte zu jeweils berechneten Funktionswerten dividiert durch die Anzahl der Werte weniger 1. Sofern nicht anders bezeichnet, werden für \pm (Standardmess-)Unsicherheiten einfache Standardabweichungen - ohne Erweiterungsfaktoren - angegeben, d.h. die Überdeckung betrifft 67% der Werte.

IMPro Execution & Audit-Trail

Data created during execution of the IMPro "ContactAngle_atConstantLevel, 22.05.23, 104997", type 4/4. Time Period of the Accomplishment: Mai., 23. 2023 between 14:59:35 and 15:29:02, elapsed time: 30 minutes. IMPro finished as projected. The complete Report first was presented on Mai., 23.23 at 16:44. Original data was changed as reported to Audit-Log:

Start of this IMPro 15:11:10, - Backup of the IMPro configuration:

Time Variables: Abs. Positions/Way: Immersion_Depth 20mm, Platform_StartPosition 85mm.

Rel. Positions/Way: FeedRateAdv 0,2mm, FeedRateRec -0,2mm, FeedRate_for_adv_rec_turn -0,050mm.

Others: Determin_0_at_Repetition -1 [Y/N].StirringTime 0s. Stirrer-Speed 0rps. Record_Air_Density -1, Temperature-Outside-Warning 0, Automatic_Thermostat_available -1.

ab 8. Wdh mit Entnahme und Abtupfung ...*

#Wilhelmy-Plate-Sequence (erstes statisch, dann speed-up dyn): 1x stat, dann $v=v*1.5$... mm/s dyn, Besch.l.g = 43 [%]: Sequ.Nº 1/21: _Equi.Time: 0,350s,

