The application of the Rossi number for the determination of physic-chemical "resultant" of some liquid materials

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The Solid-like Methodology

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PHYSIC AND CHEMICAL PROPERTIES OF COMMON PERFLUOROPOLYETHERS	
Average molecular weight (mw)	650÷6250
Fluorine (%mol)	70
Kinematic viscosity at 20 C (cSt)	1.25 ÷1300
Density (g/ml)	1.76 ÷1.92
Pour Point (C)	-25 ÷-105
Boiling Point (C)	140÷230
Vapour pression (mmHg)	10 ÷10^{-7}
Surface Tension at 20 C (dynes/cm)	17 ÷24
Refractive Index	1.268 ÷1.302

FOMBLIN HC25® PFPE

Repulsion (no friction)

SOLID SUPPORT

RELAXATION TIME (SEC)

0 30" 60" tx

Stable PFPEf fluid film (1 mm)

PFPE "FLUID FILM" READY (8')

SOLID SUPPORT

PFPEd 0.5 ml → 0

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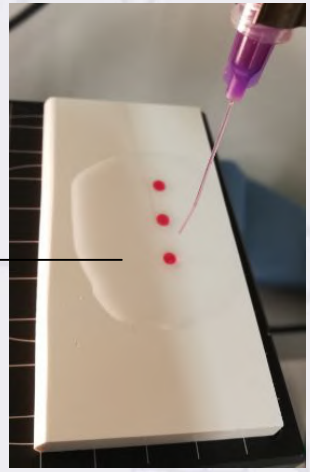
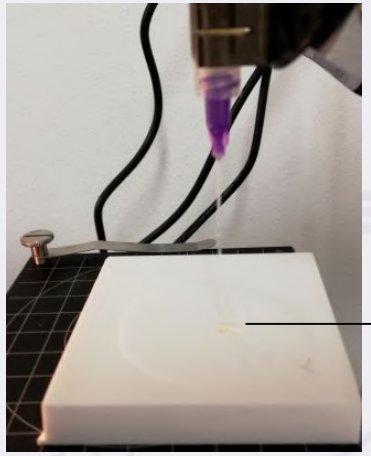
The Solid-like Methodology

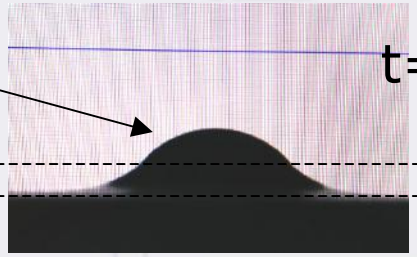
SOLID SUPPORT

PFPE
liquid film

PFPE/l
repulsion







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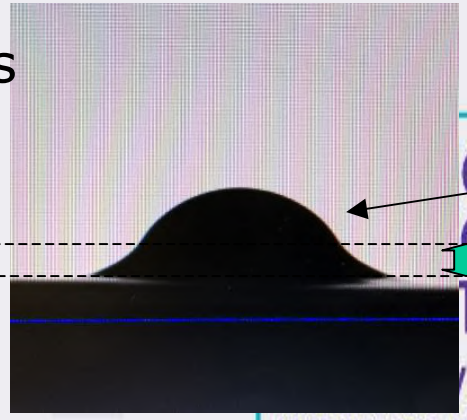

NO FRICTION
NO ROUGHNESS

Deformation liq 1
(Red wine)

Deformation liq 2
(Prosecco wine)

The Rossi number: calculation of ST, DC, PC of fluid/liquids

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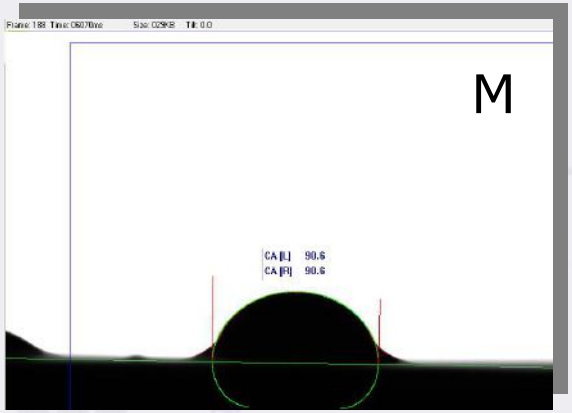
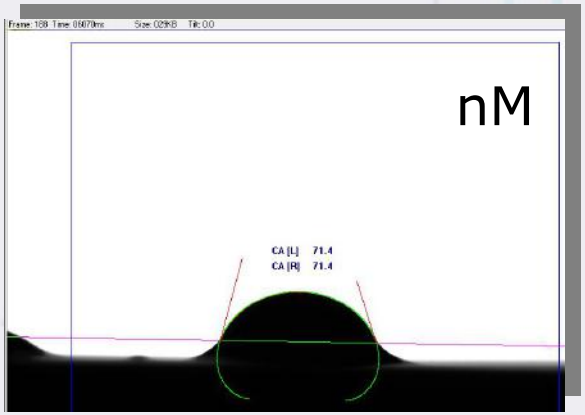
Deformation analysis



Young-Laplace



Contact angle method

Contact angle method

$$\Delta = CA^{M} - CA^{nM}$$

$$D_M = \chi^{as}_{[x]_1} - \chi^{as}_{[x]_2}$$

$$Rossi\ number = \chi^{l.}_{PI\text{-}PM\text{-}f}$$

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The Rossi number: calculation of ST, DC, PC of fluid/liquids

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$$\gamma_{SL} = \gamma_S + \gamma_L - 2\left(\sqrt{\gamma_S^D \gamma_L^D} + \sqrt{\gamma_S^P \gamma_L^P}\right)$$

Owens-Wendt

$$\frac{(1+\cos\theta)\gamma_L}{2\sqrt{\gamma_L^D}} = \sqrt{\gamma_S^D} + \sqrt{\gamma_S^P}\sqrt{\frac{\gamma_L^P}{\gamma_L^D}}$$

DC (mN/m)

PC (mN/m)

$$DC_x^{as}(mN/m) = DC_x^{nM}(mN/m) + \chi_x^{as}(1)$$

$$Rossi\ number = \chi^{L}_{PI\text{-}PEI}$$

ST (fluid/liquid)=DC(fluid/liquid)+PC(fluid/liquid)

Owens-Wendt/Rossi

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The Rossi number: calculation of ST, DC, PC of fluid/liquids

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Water mQ

	Surface tension parameters			CA (deg)		
	ST (mN/m)	DC (mN/m)	PC (mN/m)	sg	pol	PFPEf
nM meas.	51.1	1.8	49.3	35.0±1.17	98.0±2.16	66.2±4.01
M meas.	56.4	0.7	55.7	35.0±1.17	98.0±2.16	85.0±4.20
Calculated	69.2	20.0	49.2	–	–	–
Ref	72.8	21.8	51.0	–	–	–
Average	71.0	20.9	50.1			
S.D.	2.6	1.3	1.3			
CV%	3.6	6.3	2.5			

Water solutions/liquids/fluids

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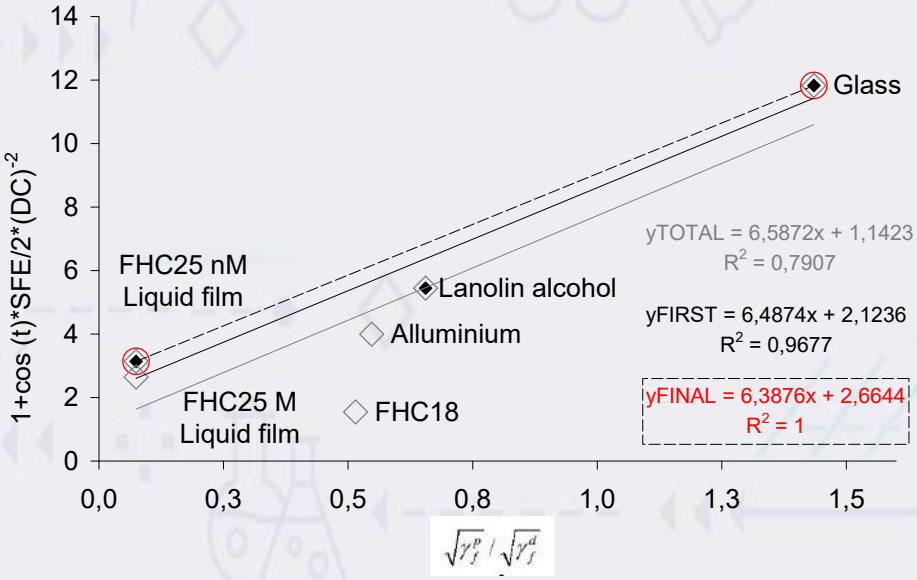
The Rossi number: calculation of ST, DC, PC of fructose-threalose

Rossi number=14.4



ST (mN/m)	DC (mN/m)	PC (mN/m)
62,4	21,6	40,8

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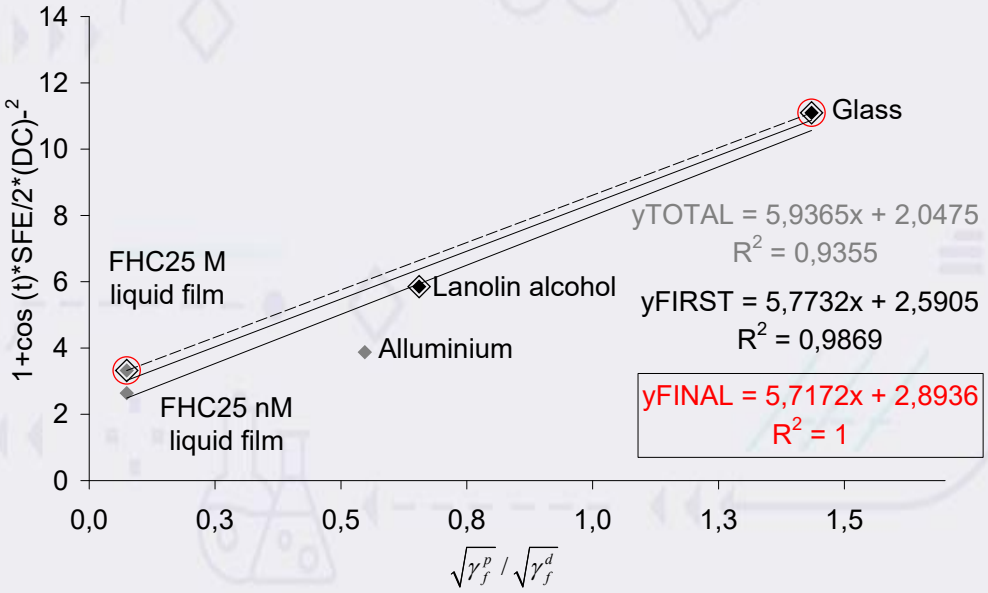
The Rossi number: calculation of ST, DC, PC of fructose-malthose

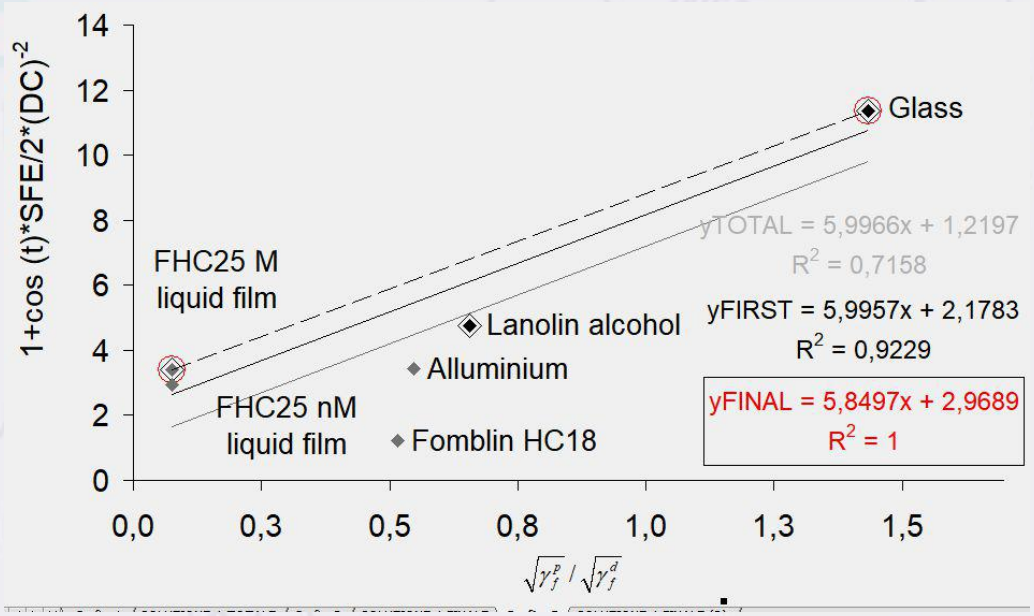
Rossi number=20.1



ST (mN/m)	DC (mN/m)	PC (mN/m)
61,2	28,5	32,7

The Rossi number: calculation of ST, DC, PC of glucose-sucrose

Rossi number=14.5



ST (mN/m)	DC (mN/m)	PC (mN/m)
56,9	26,0	30,9

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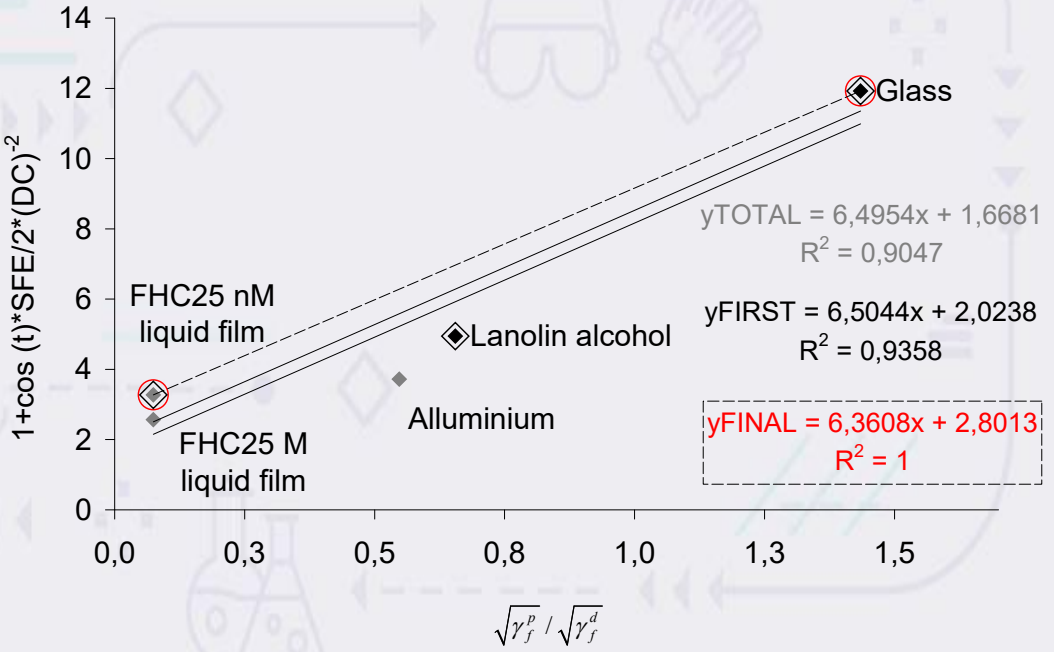
The Rossi number: calculation of ST, DC, PC of threalose-sucrose

Rossi number=20.6



ST (mN/m)	DC (mN/m)	PC (mN/m)
68,9	28,4	40,5

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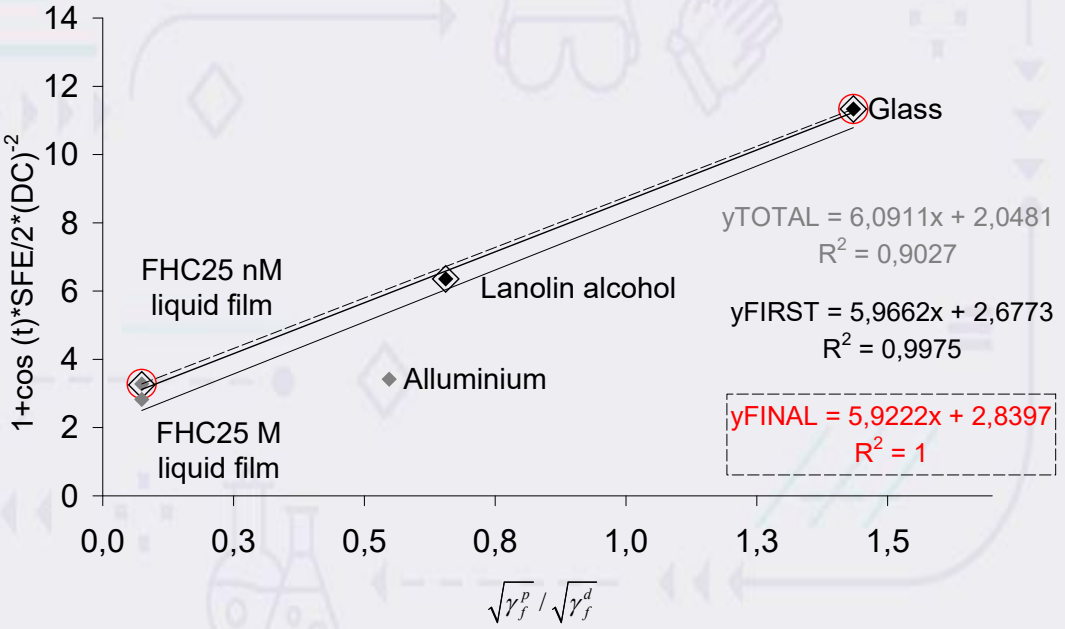
The Rossi number: calculation of ST, DC, PC of fructose-sucrose

Rossi Number=13.6



ST (mN/m)	DC (mN/m)	PC (mN/m)
56,7	21,7	35,1

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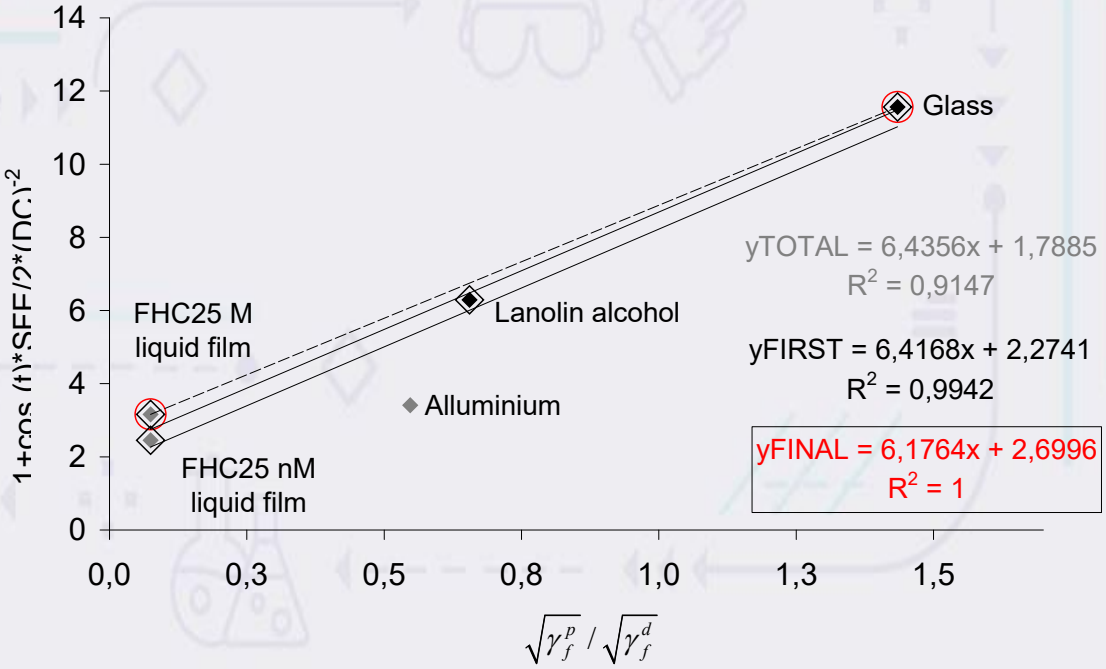
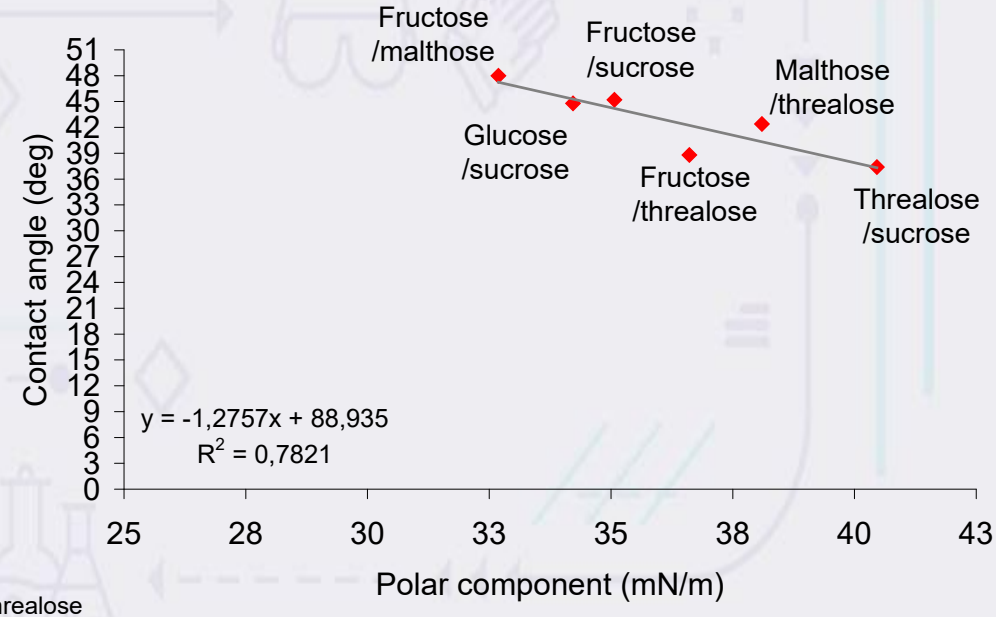
The Rossi number: calculation of ST, DC, PC of malthose-threalose

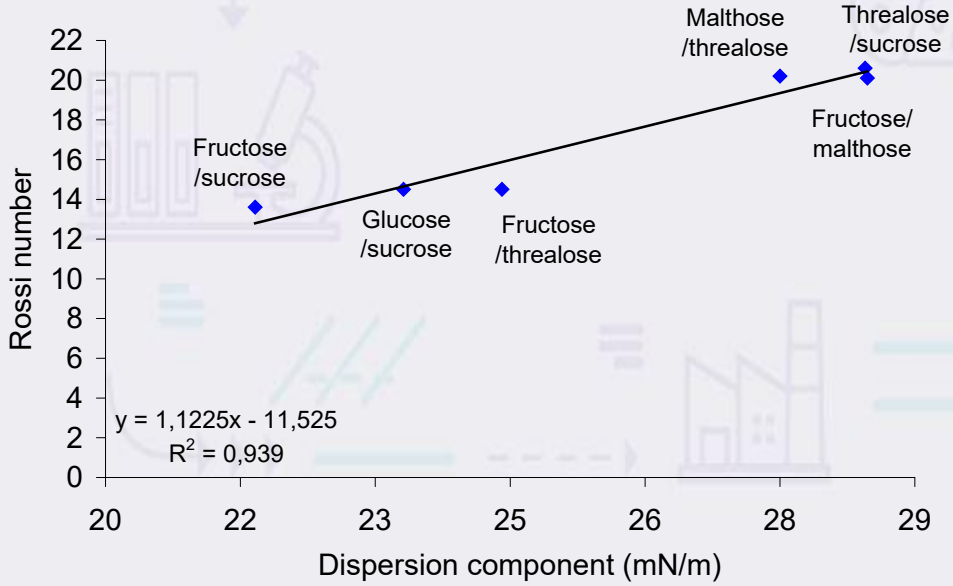
Rossi Number=20.2



ST (mN/m)	DC(mN/m)	PC(mN/m)
65,6	27,5	38,1

The Rossi number: correlations DC and PC





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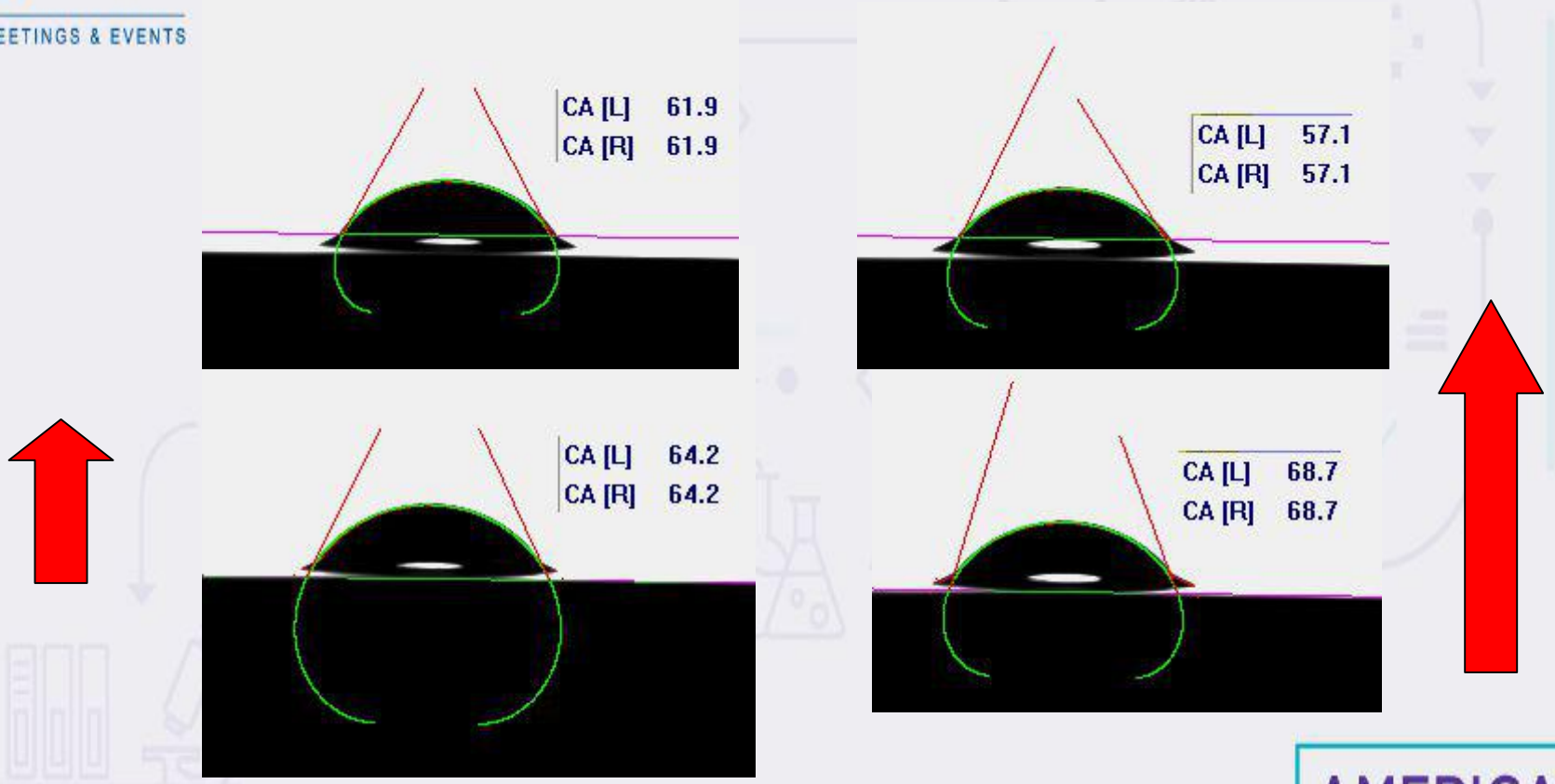
Rossi number:
ST of olive oil and PEG400



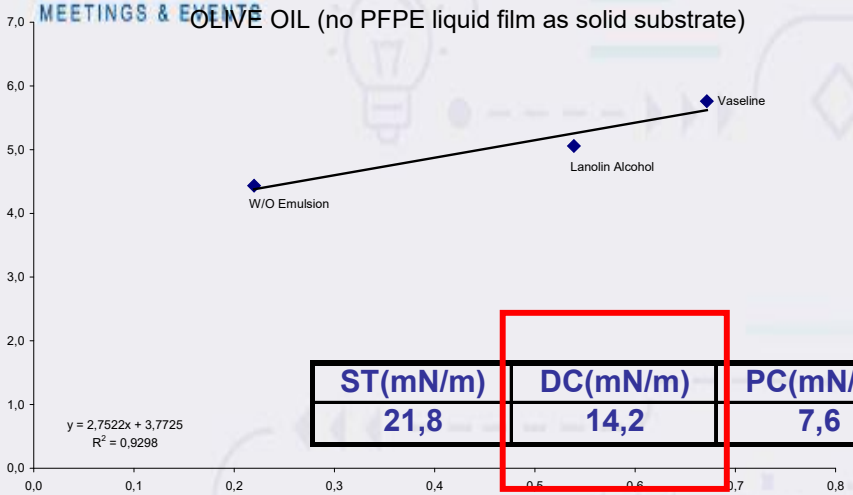
Olive oil Y-L

Low repulsion forces
Low Rossi number

PEG 400 Y-L

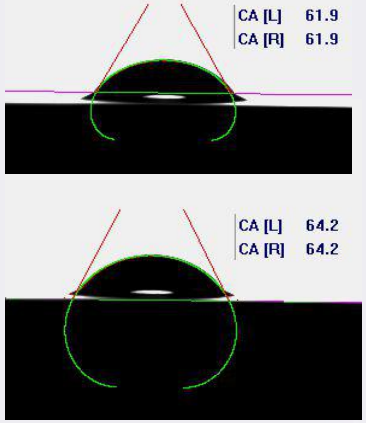
High repulsion forces
High Rossi number

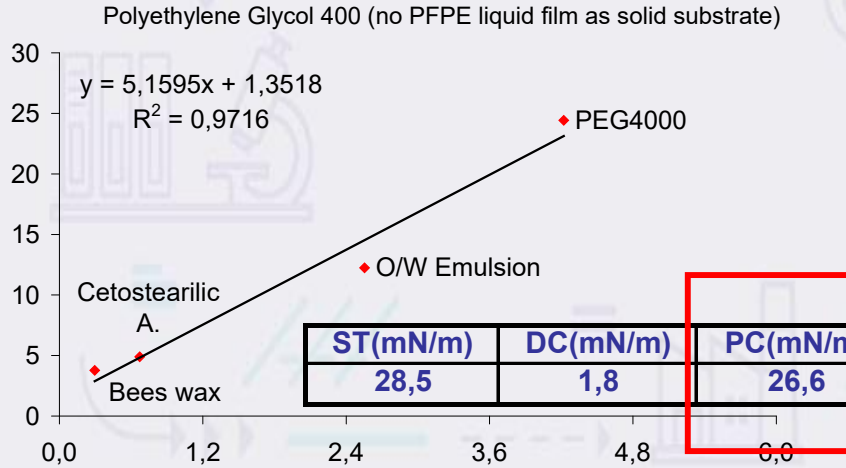
Rossi number:
ST of olive oil and PEG400



ST(mN/m)	DC(mN/m)	PC(mN/m)
21,8	14,2	7,6

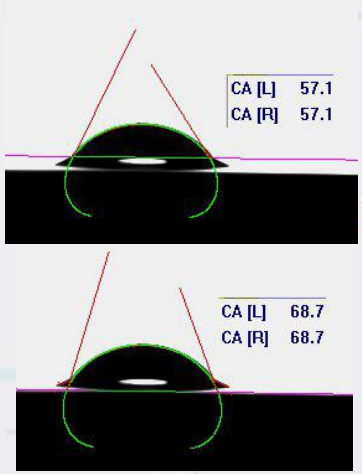
Rn=2.3





ST(mN/m)	DC(mN/m)	PC(mN/m)
28,5	1,8	26,6

Rn=11.6



Rossi number Physic-Chemical "RESULTANT"

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"The results reached here demonstrated the high discriminating capability of the methodology developed and encourage us to continue the application of SLM and the evaluation of the Rossi number in the fields of biomaterials, pharmaceuticals, food science and clinical" DR

Thank you for your attention

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