Anton Paar Tribological Cell (Ball On Three Plates)

Parameter		Ball	Plates
Steel		100Cr6	X5CrNi18-10
R_a	[nm]	30	30
Modulus of Elasticity E	[N/m^2]	2.1 x 10^{11}	1.8 x 10^{11}
Poisson's ratio *v*		0.3	0.24
Effective Radius R	[m]	0.00635	-

$$E' = \frac{2}{\left(\frac{1-{\upsilon_A}^2}{E_A} + \frac{1-{\upsilon_B}^2}{E_B}\right)}$$

Parameter			
Pressure-viscosity coefficient α	[1/Pa]	VG 46	1.65 x 10^{-9}
		VG220	1.88 x 10^{-9}
Effective Modulus of Elasticity *E'*	[N/m^2]		2.1 x 10^{11}
Ellipticity parameter *k*	[-]		1
Entrainment speed u_E	[m/s]		0,7
Load F_N	[N]		4.714
Infinite dynamic viscosity η	[Pa s]		

$$h_{min} = 3.63 \cdot U^{0.68} \cdot G^{0.49} \cdot R \cdot W^{-0.073}(1 - e^{-068k})$$

$$U = \frac{\eta u_E}{E'R}$$

$$G = \alpha E'$$

$$W = \frac{F_N}{E'R^2}$$

$$\lambda = \frac{h_{min}}{\sqrt{{R_{a,1}}^2 + {R_{a,2}}^2}}$$

Mini Traction Machine (Ball On Disc)

Parameter		Ball	Disc
Steel		100Cr6	100Cr6
R_a	[nm]	20	20
Modulus of Elasticity E	[N/m^2]	2.1 x 10^{11}	2.1 x 10^{11}
Poisson's ratio *v*		0.3	0.3
Effective Radius R	[m]	0.0095	-

$$E' = \frac{2}{\left(\frac{1-{v_A}^2}{E_A} + \frac{1-{v_B}^2}{E_B}\right)}$$

$$\frac{1}{R_x} = \frac{1}{r_{x,A}} + \frac{1}{r_{x,B}} \qquad \frac{1}{R_y} = \frac{1}{r_{y,A}} + \frac{1}{r_{y,B}} \qquad \frac{1}{R} = \frac{1}{R_x} + \frac{1}{R_y}$$

Parameter			
Pressure-viscosity coefficient *α*	[1/Pa]	VG 46	1.65 x 10^{-9}
		VG220	1.88 x 10^{-9}
Effective Modulus of Elasticity *E'*	[N/m^2]		2.33 x 10^{11}
Ellipticity parameter *k*	[-]		1
Entrainment speed u_E	[m/s]		3.5
Load F_N	[N]		4.714
Infinite dynamic viscosity η	[Pa s]		

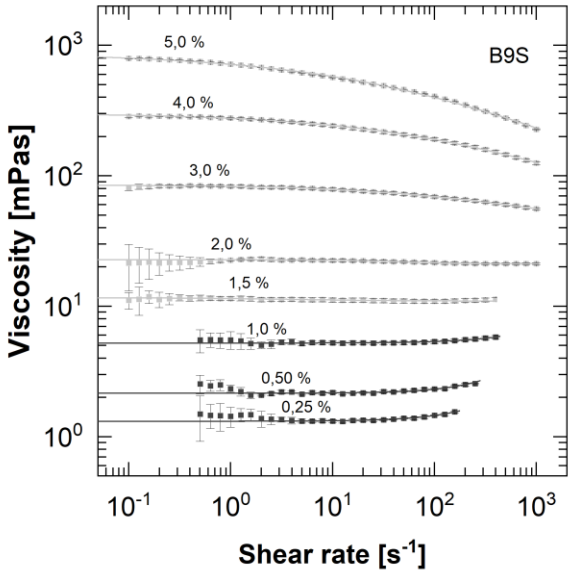
$$h_{min} = 3.63 \cdot U^{0.68} \cdot G^{0.49} \cdot R \cdot W^{-0.073}(1 - e^{-068k})$$

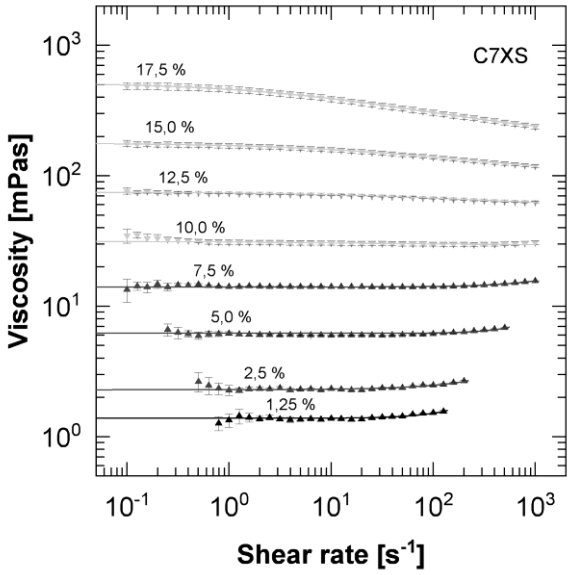
$$U = \frac{\eta u_E}{E'R}$$

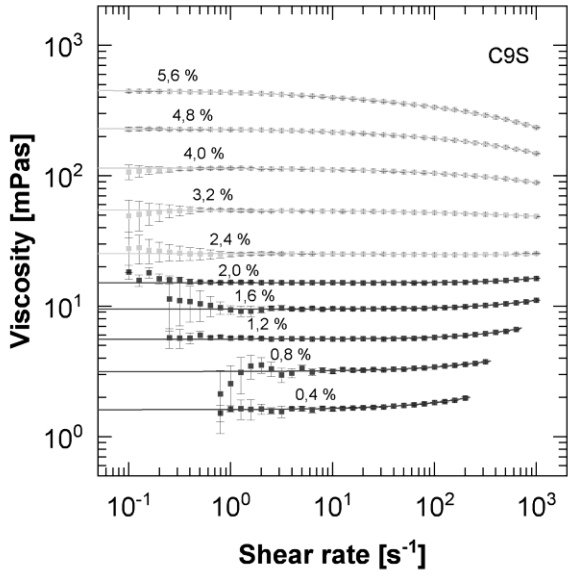
$$G = \alpha E'$$

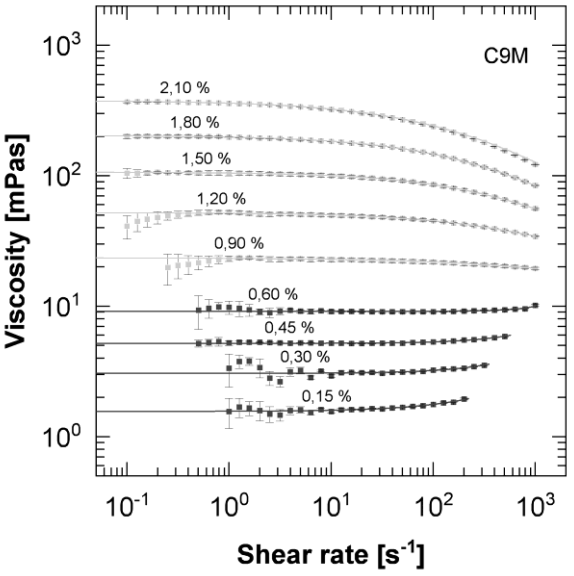
$$W = \frac{F_N}{E'R^2}$$

$$\lambda = \frac{h_{min}}{\sqrt{{R_{a,1}}^2 + {R_{a,2}}^2}}$$


B9S
5,0 %
4,0 %
3,0 %
2,0 %
1,5 %
1,0 %
0,50 %
0,25 %
Viscosity [mPas]
Shear rate [s-1]


C7XS
17,5 %
15,0 %
12,5 %
10,0 %
7,5 %
5,0 %
2,5 %
1,25 %
Viscosity [mPas]
Shear rate [s-1]


C9S
5,6 %
4,8 %
4,0 %
3,2 %
2,4 %
2,0 %
1,6 %
1,2 %
0,8 %
0,4 %
Viscosity [mPas]
Shear rate [s-1]


C9M
2,10 %
1,80 %
1,50 %
1,20 %
0,90 %
0,60 %
0,45 %
0,30 %
0,15 %
Viscosity [mPas]
Shear rate [s-1]