Short Communications

A Diagram for the Determination of the Surface Tension of Mineral Oil Fractions (Hydrogenated and Non-hydrogenated) from their Kinematic Viscosity and Density

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In a recent publication¹ the present authors presented a method to determine the surface tension at 20°C in dynes/cm,

σ_{20} , of *saturated* mineral oil fractions from their kinematic viscosity at 20°C in centistokes, ν_{20} , and refractive index, n_D^{20} . The values obtained by this method are generally as accurate as the experimental values.

In a second publication² a method was described to determine σ_{20} of *non hydrogenated* (original) mineral oil fractions from ν_{20} , n_D^{20} and the density at 20°C, d_4^{20} . Use was made of 5 cross-sections for constant ν_{20} -values of the ν - n - d space model³⁻⁵. Again good results were obtained.

It appears that the lines of constant σ_{20} values are straight and are running parallel to the n_D^{20} axis of the n , d -cross-sections. This means that for a constant

Fig. 1. $\log \nu_{20}$, d_4^{20} diagram for the determination of the surface tension at 20°C of non-hydrogenated as well as hydrogenated mineral oil fractions.

Table 1

Fraction $d_{\frac{20}{4}}^{\frac{20}{4}}$ $\log \nu_{20}$ (σ_{20})pred. (σ_{20})exp. $\Delta\sigma =$ ($\sigma_{\text{pred.}} - \sigma_{\text{exp.}}$)						Fraction $d_{\frac{20}{4}}^{\frac{20}{4}}$ $\log \nu_{20}$ (σ_{20})pred. (σ_{20})exp. $\Delta\sigma =$ ($\sigma_{\text{pred.}} - \sigma_{\text{exp.}}$)					
Venezuela						4H	0.8337	0.848	28.5	28.4	+0.1
Tin 1 fr.						5	0.8723	1.158	30.0	29.5	+0.5
1	0.8158	0.319	26.7	26.6	+0.1	5H	0.8471	1.107	29.4	29.2	+0.2
1H	0.7990	0.342	26.3	26.4	-0.1	6	0.8906	1.546	30.8	30.6	+0.2
2	0.8235	0.455	27.3	27.0	+0.3	6H	0.8593	1.442	30.1	29.9	+0.2
2H	0.8080	0.458	27.0	27.0	0	7	0.9055	1.977	31.3	31.2	+0.1
3	0.8397	0.602	27.8	27.2	+0.6	7H	0.8717	1.805	30.7	30.7	0
3H	0.8154	0.605	27.5	27.7	-0.2	8H	0.8801	2.151	31.0	31.2	-0.2
4	0.8363	0.752	28.3	27.8	+0.5	Borneo					
4H	0.8197	0.741	28.0	28.1	-0.1	Tin 4 fr.					
5	0.8429	0.953	29.0	28.7	+0.3	1	0.8363	0.242	27.1	27.4	-0.3
5H	0.8260	0.926	28.5	28.8	-0.3	1H	0.8067	0.288	26.3	26.2	+0.1
6	0.8510	1.129	29.5	29.4	+0.1	2	0.8446	0.299	27.5	27.7	-0.2
6H	0.8320	1.082	29.1	29.4	-0.3	2H	0.8140	0.345	26.7	27.0	-0.3
7	0.8594	1.334	30.0	29.8	+0.2	3	0.8537	0.358	28.0	28.0	0
7H	0.8390	1.282	29.5	29.8	-0.3	3H	0.8210	0.396	27.1	27.3	-0.2
8	—	—	—	—	—	4	0.8634	0.428	28.4	28.3	+0.1
8H	0.8453	1.472	29.9	30.2	-0.3	4H	0.8282	0.464	27.5	27.6	-0.1
Borneo						5	0.8709	0.489	28.7	28.3	+0.4
Tin 2 fr.						5H	0.8331	0.505	27.7	27.9	-0.2
1	0.8414	0.324	27.5	27.3	+0.2	6	0.8766	0.556	29.0	29.0	0
1H	0.8325	0.352	27.3	26.7	+0.6	7	0.8804	0.634	29.1	28.9	+0.2
2	0.8530	0.390	28.0	27.9	+0.1	7H	0.8404	0.631	28.2	28.5	-0.3
2H	0.8406	0.424	27.7	27.3	+0.4	9	0.8808	0.846	29.7	29.5	+0.2
3	0.8657	0.473	28.5	28.4	+0.1	9H	0.8429	0.798	28.7	28.7	0
3H	0.8482	0.488	28.1	27.9	+0.2	Rumania					
4	0.8762	0.543	29.0	29.0	0	Tin 5 fr.					
4H	0.8554	0.562	28.4	28.3	+0.1	1	0.8029	0.254	26.1	25.9	+0.2
5	0.8868	0.622	29.5	29.5	0	1H	0.7857	0.276	25.8	25.9	-0.1
5H	0.8605	0.627	28.7	28.8	-0.1	2	0.8123	0.365	26.8	26.6	+0.2
6	0.8978	0.709	29.9	29.9	0	2H	0.7963	0.387	26.3	26.7	-0.4
6H	0.8673	0.708	29.0	29.3	-0.3	3H	0.8064	0.507	27.0	27.1	-0.1
7	0.9100	0.816	30.6	30.6	0	4	0.8328	0.649	28.0	27.9	+0.1
7H	—	—	—	—	—	4H	0.8153	0.647	27.7	27.7	0
8	0.9186	0.911	31.0	31.0	0	5	0.8390	0.828	28.6	28.4	+0.2
8H	0.8756	0.856	29.6	29.8	-0.2	5H	0.8220	0.811	28.2	28.4	-0.2
9	0.9323	1.100	31.5	31.4	+0.1	6	0.8469	1.033	29.2	29.0	+0.2
9H	0.8872	1.025	30.2	30.3	-0.1	6H	0.8299	0.993	28.8	29.1	-0.3
10	0.9448	1.360	32.0	32.1	-0.1	7H	0.8389	1.184	29.4	29.9	-0.5
10H	0.8945	1.217	30.6	30.8	-0.2	Sumatra					
11	0.9612	1.854	32.5	32.6	-0.1	Tin 6 fr.					
11H	0.9070	1.570	31.2	31.5	-0.3	1	0.8090	0.160	26.0	26.0	0
12H	0.9199	2.181	31.7	32.1	-0.4	1H	0.7918	0.202	25.7	25.3	+0.4
Mexico						2	0.8125	0.196	26.2	26.3	-0.1
Tin 3 fr.						2H	0.7944	0.230	25.8	25.4	+0.4
1	0.8058	0.311	26.4	25.9	+0.5	3	0.8178	0.252	26.5	—	—
1H	0.7944	0.327	26.2	26.0	+0.2	3H	0.8010	0.277	26.1	25.9	+0.2
2	0.8187	0.435	26.8	26.8	0	4	0.8238	0.312	26.9	26.9	0
2H	0.8049	0.443	26.8	26.7	+0.1	4H	0.8077	0.336	26.5	26.4	+0.1
3	0.8363	0.624	28.0	27.7	+0.3	5	0.8302	0.378	27.3	27.2	+0.1
3H	0.8198	0.631	27.7	27.5	+0.2	5H	0.8137	0.398	26.9	26.8	+0.1
4	0.8551	0.871	29.2	28.7	+0.5						

Fraction	d_{4}^{20}	$\log \nu_{20}$	$(\sigma_{20})_{\text{pred.}}$	$(\sigma_{20})_{\text{exp.}}$	$\Delta\sigma = (\sigma_{\text{pred.}} - \sigma_{\text{exp.}})$	Fraction	d_{4}^{20}	$\log \nu_{20}$	$(\sigma_{20})_{\text{pred.}}$	$(\sigma_{20})_{\text{exp.}}$	$\Delta\sigma = (\sigma_{\text{pred.}} - \sigma_{\text{exp.}})$
6	0.8372	0.447	27.7	27.5	+0.2	2H	0.7940	0.368	26.2	26.2	0
6H	0.8195	0.462	27.3	27.2	+0.1	3	0.8188	0.474	27.3	27.2	+0.1
7	0.8444	0.529	28.1	28.0	+0.1	3H	0.8027	0.388	26.5	26.7	-0.2
7H	0.8260	0.539	27.6	27.5	+0.1	4	0.8305	0.604	27.9	28.0	-0.1
8	0.8519	0.613	28.5	28.5	0	4H	0.8123	0.608	27.5	27.3	+0.2
8H	0.8318	0.638	28.0	28.0	0	5	0.8419	0.772	28.5	28.2	+0.3
9	0.8586	0.713	28.8	28.7	+0.1	5H	0.8213	0.754	28.0	27.9	+0.1
9H	0.8375	0.705	28.3	28.3	0	6	0.8538	0.960	29.3	29.2	+0.1
10	0.8651	0.840	29.3	29.2	+0.1	7	0.8679	1.183	29.9	29.5	+0.4
10H	0.8439	0.830	28.7	29.8	-0.1	7H	0.8390	1.116	29.2	29.1	+0.1
11	0.8726	1.010	29.8	29.7	+0.1	8	0.8814	1.450	30.6	30.5	+0.1
11H	0.8507	0.979	29.2	29.2	0	8H	0.8481	1.333	29.7	29.6	+0.1
12	0.8857	1.244	30.4	30.2	+0.2	Texas Tin 11 fr.					
12H	0.8605	1.178	29.8	29.8	0						
13	0.9065	1.644	31.2	31.0	+0.2	1	0.8082	0.274	26.3	26.5	-0.2
13H	0.8753	1.492	30.5	30.7	-0.2	1H	0.7963	0.316	26.1	26.1	0
Sumatra Tin 7 fr.						2	0.8174	0.367	26.9	26.7	+0.2
						2H	0.8041	0.389	26.6	26.3	+0.3
1	0.8081	0.228	26.2	26.0	+0.2	3	0.8283	0.488	27.5	27.6	-0.1
2	0.8136	0.283	26.5	26.7	-0.2	3H	0.8125	0.500	27.2	26.9	+0.3
2H	0.7953	0.327	26.2	26.4	-0.2	4	0.8379	0.643	28.2	28.3	-0.1
3	0.8213	0.356	27.0	26.9	+0.1	4H	0.8217	0.642	27.7	27.6	+0.1
3H	0.8021	0.382	26.5	26.6	-0.1	5	0.8465	0.818	28.8	28.8	0
4	0.8284	0.419	27.3	27.1	+0.2	5H	0.8297	0.812	28.4	28.6	-0.2
4H	0.8068	0.445	26.9	27.0	-0.1	6	0.8552	1.032	29.5	29.2	+0.3
5	0.8351	0.493	27.7	27.6	+0.1	6H	0.8362	0.993	29.0	29.0	0
5H	0.8121	0.499	27.2	27.2	0	7	0.8665	1.274	30.0	29.9	+0.1
6	0.8401	0.575	28.0	28.3	-0.3	7H	0.8462	1.211	29.5	29.7	-0.2
6H	0.8179	0.580	27.5	27.6	-0.1	value of ν_{20} and d_{4}^{20} the value of σ_{20} is independent of the refractive index. There- fore it is possible to construct a diag- ram with the coordinates $\log \nu_{20}$ and d_{4}^{20} , (Fig. 1). In the diagram lines of equal values of σ_{20} have been given.					
7	0.8409	0.663	28.3	28.2	+0.1						
7H	0.8200	0.663	27.8	27.9	-0.1	This diagram has primarily been con- structed for the determination of the surface tension of non-hydrogenated mine- ral oil fractions.					
8	0.8392	0.765	28.5	28.5	0						
8H	0.8208	0.758	28.0	28.2	-0.2	It appears however to be possible after the necessary extension of the diagram to use it also for the determination of σ_{20} of saturated oil fractions. The diagram (Fig. 1) has been tested on several (164) mineral oil fractions, with the results shown in Table 1. In this table the graphi- cally determined σ_{20} values have been indicated by $(\sigma_{20})_{\text{pred.}}$, and the experi- mental values of σ_{20} by $(\sigma_{20})_{\text{exp.}}$. $\Delta\sigma$ $= (\sigma_{20})_{\text{pred.}} - (\sigma_{20})_{\text{exp.}}$. The hydrogenated mineral oil fractions are indicated by H.					
9	0.8380	0.853	28.6	28.2	+0.4						
9H	0.8215	0.869	28.3	28.6	-0.3	As can be seen from the table the results obtained in the determination of the					
10	0.8396	1.009	29.0	28.9	+0.1						
10H	0.8251	0.993	28.7	29.0	-0.3						
Venezuela Tin 8 fr.						Persia (Iran) Tin 9 fr.					
1	0.8400	0.423	27.7	27.5	+0.2	1	0.7982	0.260	26.0	26.0	0
1H	0.8204	0.454	27.3	27.4	-0.1	1H	0.7873	0.292	25.9	25.7	+0.2
2	0.8755	0.806	29.5	28.9	+0.6	2	0.8077	0.363	26.6	26.5	+0.1
2H	0.8440	0.750	28.6	28.7	-0.1						
3	0.9036	1.309	31.0	30.3	+0.7						
3H	0.8635	1.163	29.8	29.8	0						
4	0.9255	1.974	31.8	31.5	+0.3						
4H	0.8750	1.485	30.5	30.6	-0.1						
5	0.9396	2.687	32.1	31.9	+0.2						
5H	0.8880	2.155	31.1	31.5	-0.4						

surface tension at 20°C by means of the new method are as good as those obtained by means of the previous methods^{1,2}. The advantages of the new method are that the surface tension at 20°C can be determined for hydrogenated as well as for non-hydrogenated mineral oil fractions by means of only one graph, using two, properly chosen, physical constants.

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Die Verbreitung der Umbelliferose in der Pflanzenfamilie der Umbelliferen

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Nach der Ermittlung der Konstitution der Umbelliferose¹ (2'- α -D-galactopyranosyl-2- α -D-glucopyranosyl- β -D-fructofuranose) haben wir es von Interesse gefunden, zu untersuchen, ob das neue Trisaccharid, das wir früher in 3–4 verschiedenen Doldenpflanzen nachgewiesen haben², ein allgemein vorkommender Bestandteil bei den Umbelliferen sei. Um diese Untersuchung durchführen zu können, haben wir Papierchromatographie benutzt. In einem Flüssigkeitsgemisch von Amylalkohol, Pyridin und Wasser ist es möglich, Trisaccharide — u.a. Raffinose und Umbelliferose — zu trennen. Die erwähnten Zucker passieren bei einer 20–24-stündigen Durchlaufschromatographie (Whatman Filtrierpapier No. 1) etwa 8 cm, beziehungsweise 10 cm.

In einigen der unten beschriebenen Fälle wurde nur der oberirdische Teil der Pflanze, in den meisten Fällen aber wurden sowohl der unterirdische als der oberirdische Teil untersucht; in einigen Fällen wurden sogar Wurzel, Stengel, Blatt, Blumendolde und Dolde mit unreifen, grünen Früchten je für sich untersucht. In sämtlichen Fällen konnte die Umbelliferose in allen Teilen der Pflanze nachgewiesen werden. Die Menge schien von Art zu Art und von Pflanzenteil zu Pflanzenteil etwas zu variieren, ohne dass diese quantitative Frage vorläufig näher behandelt wurde. Neben der Umbelliferose haben wir in allen untersuchten Arten bedeutende Mengen von Saccharose und kleine Mengen von Monosacchariden gefunden. Bei den Untersuchungen wurde wegen der Gefahr eines enzymatischen Abbaus der Umbelliferose immer frisches Pflanzenmaterial nach Stabilisierung in kochendem Alkohol verwendet.

Nachstehend sind die untersuchten Arten tabellarisch zusammengestellt. Sämtliche enthalten Umbelliferose.

Aegopodium podagraria L.
Aethusa cynapium L.
Angelica archangelica L.
 subsp. *norvegica* (Rupr.) Nordh.
 subsp. *litoralis* (Fr.) Thell.
Angelica silvestris L.
Anthriscus silvestris (L.) Hoffm.
Carum carvi L.
Chaerophyllum aromaticum L.
Conium maculatum L.
Heracleum sphondylium L.
Imperatoria ostruthium L.
Levisticum officinale Koch.
Ligusticum scoticum L.
Meum athamanticum Jacq.
Myrrhis odorata (L.) Scop.
Pimpinella major (L.) Huds.
Pimpinella saxifraga L.
Sium sisarum L.

Aufarbeitung des Pflanzenmaterials: 10–50 g frisches Pflanzenmaterial wurde mit 150–250 ml Äthanol und 1–2 g Kalciumkarbonat in einem "Waring Blendor" 3 Minuten fein zerrieben, worauf das Gemisch sofort zum Sieden gebracht wurde. Das Pflanzenmaterial wurde nach Abkühlen abfiltriert und mit 20–30 ml Wasser ausgewaschen. Die gesammelten Filtrate wurden dann während ein paar Minuten mit etwa 5 ml gequollenem saurem Ionenaustauscher (Amberlite IR 120) und nach Filtrieren in der nämlichen Weise mit Amberlite IRA 400 geschüttelt. Das Filtrat wurde in