

## ENCLOSURE (A)

Part V  
DATA ON THE RAMAN SPECTRA OF HYDROCARBONSEthane

(From Ethylmagnesium iodide and water)

993 (7)	2883 (10)
1462 (5b)	2914 (4)
2732 (4)	2939 (10)
2863 (3)	2695 (9)

W. NAKAMURA &amp; E. KANDA: J. Chem. Soc. Japan, 60 (1939) 1275.

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n-Butene(Butylchloride reduced by sodium in liquid ammonia and distilled.)  
(J. C. S. 49 (1927) 750)

223 (0)	1168 (0)
259 (0)	1168 (0)
287 (0)	1281 (0)
320 (1)	1301 (1b)
429 (5)	1444 (5b)
789 (2)	2666 (1)
809 (0)	2702 (1)
827 (6)	2733 (3)
837 (7)	2860 (8)
955 (1b)	2877 (10)
980 (2)	2914 (5)
1057 (4)	2938 (8b)
1077 (1)	2962 (6b)
1150 (2)	

S. MIZUSHIMA, MORINO and OKAZAKI: J. Ch. Soc. Japan, 60(1939), 289.  
W. NAKAMURA and E. KANDA: Ibid. 60 (1939), 1275.

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n-Pentane B.P. 36.3,  $n_D^{20}$  1.3577.  
(From Fischer oil purified by distillation)

333 (1)	1264 (1)
400 (7)	1302 (4b)
467 (2)	1437 (5b)
764 (3)	1458 (6b)
839 (5)	2666 (1)
864 (4)	2713 (1)
904 (1b)	2733 (2)
983 (0)	2847 (5)
99C (1)	2881 (8)
1025 (3)	2878 (10)
1035 (3)	2908 (5b)
1072 (3b)	2936 (8b)
1142 (3)	2964 (8b)
1165 (0)	

OKAZAKI: J. Chem. Soc. Japan, 60 (1939) 559.  
S. MIZUSHIMA, MORINO & TAKEEDA: So. Rep.  
Inst. Phy. Chem. Res., (TOKYO) 30 (1941) 437.

## ENCLOSURE (A)

n-Hexane, B.P. 6819,  $n_D^{20}$  1.3748.  
(Fischer oil distillation)  $d_4^{20}$  0.6615.

310 (2b)	1081 (3)
329 (1)	1140 (3)
370 (4)	1304 (4)
399 (4)	1439 (6)
448 (1b)	1456 (6)
746 (0b)	2703 (1)
809 (1b)	2731 (2)
820 (3)	2849 (5b)
867 (3)	2861 (5b)
895 (6)	2875 (12)
949 (0b)	2896 (4b)
970 (0)	2911 (5b)
1004 (1)	2939 (10)
1038 (3)	2964 (10)

OKAZAKI; J. Chem. Soc. Japan, 60(1939) 559.  
S. MIZUSHIMA, MORINO & TAKEDA: Sc. Pap.  
Inst. Phy. Chem. Res. (TOKYO) 38 (1941) 437.

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2-2-Dimethyl butane, (Neohexane)  
(Phillip's material was fractionated. B.P. 49.5 - 50.5)

97 (1b)	1252 (6)
258 (2)	1304 (3)
336 (3)	1446 (8)
361 (3)	1466 (4b)
408 (1)	2655 (0)
484 (2)	2711 (2)
712 (10)	2851 (3)
868 (6)	2865 (7)
926 (6)	2892 (4)
995 (0)	2903 (12)
1017 (4)	2940 (6b)
1076 (3)	2965 (6b)
1215 (6)	

S. MIZUSHIMA, MORINO & TAKEDA: Loc. cit.

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ENCLOSURE (A)

2-3, Dimethyl butane

96	(1b)	1159	(5b)
220	(0)	1196	(2)
291	(1)	1263	(0)
346	(1)	1300	(3)
378	(0)	1321	(0)
397	(0)	1344	(3)
432	(0b)	1388	(0)
477	(2)	1440	(5b)
504	(3)	1467	(6b)
629	(00)	2670	(0)
728	(10)	2718	(3)
755	(5)	2735	(0)
815	(0)	2756	(1)
847	(0)	2774	(1)
869	(3)	2855	(7)
929	(3)	2871	(10b)
940	(3)	2903	(5b)
956	(2)	2935	(4b)
1029	(2)	2961	(10b)
1039	(3)	2982	(6)
1150	(1)		

OKAZAKI: J. Chem. Soc. Japan, 60(1939) 559.

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- (I) B.P. 98.4°C d<sub>4</sub><sup>20</sup> 0.6838; n<sub>D</sub><sup>20</sup> 1.3877 (from Prof. NAGAI)  
 (II) (Sample from standard fuel for octane rating, California Chem. Co. B.P. 98.4 - 98.6°C fractionated.)

(I)

198	(0)	1031	(1)
223	(0)	1045	(3)
232	(1)	1056	(2)
312	(6)	1049	(2)
356	(2)	1081	(4)
394	(3)	1138	(4)
405	(1)	1161	(2)
454	(1)	1209	(0)
506	(1)	1235	(1)
696	(0)	1262	(0)
722	(0)	1281	(0)
742	(1)	1299	(6b)
777	(5b)	1310	(1)
806	(0)	1342	(1)
826	(5)	1365	(0)
840	(4)	1433	(6b)
852	(2)	1452	(5b)
866	(0)	2670	(0)
885	(2)	2710	(1)
900	(5)	2732	(3)
907	(2)	2844	(10)
929	(1)	2873	(8)
949	(1)	2900	(5b)
961	(7)	2938	(8)
986	(00)	2964	(10b)
1061	(1)		

## ENCLOSURE (A)

## n-Heptane (Continued)

(II)

282	(0)	1138	(3)
309	(4)	1163	(1)
356	(0)	1207	(0)
394	(2)	1272	(1)
453	(1)	1300	(6)
483	(0)	1343	(0)
505	(0)	1370	(0)
719	(0)	1436	(8b)
743	(0)	1457	(8b)
778	(1)	2670	(1)
838	(3)	2707	(1)
854	(1)	2733	(3)
886	(1)	2850	(7)
904	(4)	2860	(3)
931	(0)	2874	(10)
962	(1)	2906	(8b)
1020	(1)	2938	(10)
1046	(4)	2964	(10)

MIZUSHIMA, KORINO &amp; OKAZAKI: J. Chem. Soc. Japan, 60(1939) 290.

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2,2,3-Trimethyl butane

219	(0)	1109	(3)
260	(0)	1160	(0)
295	(1)	1204	(2)
358	(4)	1218	(4)
389	(3)	1250	(5)
437	(1)	1326	(5b)
460	(2)	1361	(0)
521	(4)	1435	(2)
561	(0)	1452	(3)
583	(0)	1471	(3)
603	(00)	2711	(4)
687	(10)	2733	(0)
833	(4)	2756	(0)
922	(7b)	2867	(6)
987	(1)	2905	(6)
1054	(00)	2947	(7b)
1080	(3)	2968	(7b)

S. MIZUSHIMA, KORINO &amp; OKAZAKI: J. Chem. Soc. Japan, 60(1939) 290.

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ENCLOSURE (A)

n-Octane, B.P. 124°, <sup>20</sup>d<sub>4</sub> 1.3978; <sup>20</sup>n<sub>D</sub> 1.7043

196	(0)	999	(0)
218	(0)	1026	(2)
241	(0)	1045	(2)
279	(5)	1060	(4)
295	(1)	1083	(4b)
347	(0)	1137	(4)
374	(1)	1162	(1)
399	(0)	1199	(0)
427	(1)	1226	(0)
457	(0)	1299	(5b)
505	(0b)	1342	(0)
696	(0)	1366	(0b)
723	(1)	1434	(7b)
735	(1)	1459	(5b)
766	(1)	2668	(1)
815	(2b)	2714	(0)
843	(8)	2732	(3)
861	(3)	2849	(10)
878	(3)	2873	(6)
896	(4)	2904	(6)
953	(1)	2937	(8)
970	(2)	2965	(8b)

MIZUSHIMA, MORINO & OKAZAKI: J. C. S. Japan, 60(1939) 289.

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2,2,3-Trimethyl pentane

345	(2b)	1201	(2)
373	(0)	1221	(3)
393	(1)	1246	(3)
446	(1)	1303	(1)
469	(0)	1328	(1)
526	(3)	1348	(1)
716	(6)	1444	(6b)
828	(2)	1468	(4b)
894	(3)	2717	(0)
927	(5)	2866	(6b)
975	(3)	2907	(5b)
1068	(2)	2945	(4b)
1081	(1)	2972	(10b)
1118	(0)		

MIZUSHIMA, MORINO & OKAZAKI: J. C. S. Japan, 60(1939) 289.

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## ENCLOSURE (A)

2,2,4-Trimethyl pentane  
 B.P. 98.0 - 98.1°C,  $d_4^{20}$  0.6918;  $n_D^{20}$  1.3916 (America)

191	(1)	1113	(1b)
280	(0)	1167	(2)
292	(3b)	1205	(3b)
310	(1b)	1246	(5)
350	(1)	1283	(2)
370	(0)	1302	(0)
417	(1)	1349	(2)
456	(0)	1364	(0)
510	(3b)	1390	(0b)
714	(0)	1432	(1)
745	(10)	1447	(5)
816	(0)	1461	(2)
828	(2)	1469	(3)
861	(0)	2715	(2)
899	(5)	2759	(0)
926	(6)	2842	(3)
952	(3)	2862	(8b)
978	(0)	2906	(6b)
1014	(0)	2935	(3)
1020	(1)	2956	(10b)
1097	(2)		

TAKEDA: J. C. S. Japan, 62(1941) 896.

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## n-Nonane

196	(0)	926	(0)
221	(0)	970	(1b)
248	(3)	1019	(1)
264	(4)	1046	(0)
283	(1)	1092	(3)
340	(1)	1082	(3b)
375	(1)	1154	(3)
404	(1)	1159	(1)
417	(1)	1192	(0)
453	(1b)	1217	(0)
490	(0)	1299	(4b)
510	(0)	1340	(0)
548	(0)	1433	(8)
607	(0)	1460	(8)
721	(1)	2666	(1)
751	(1)	2706	(1)
781	(1)	2751	(1)
830	(3)	2848	(10)
843	(3)	2873	(2)
871	(3)	2935	(7)
892	(4)	2964	(8)

OKAZAKI: J. C. S. Japan 60(1939) 869.

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ENCLOSURE (A)

n-Decane

200 (0)  
 230 (3)  
 250 (5)  
 339 (0)  
 359 (1)  
 404 (2b)  
 441 (1)  
 465 (1)  
 521 (0)  
 661 (0)  
 692 (1)  
 723 (1)  
 744 (1)  
 722 (2b)  
 810 (2b)  
 844 (3b)  
 870 (1)  
 886 (3)  
 898 (3)  
 921 (1)  
 952 (1)  
 971 (1)

991 (1)  
 1008 (1)  
 1023 (1)  
 1047 (2)  
 1062 (4)  
 1080 (4)  
 1092 (3)  
 1133 (4)  
 1161 (2)  
 1189 (0)  
 1211 (0)  
 1301 (6b)  
 1340 (1)  
 1366 (1)  
 1433 (8b)  
 1460 (6b)  
 2673 (1)  
 2732 (3)  
 2550 (10)  
 2897 (6b)  
 2936 (7)  
 2966 (8)

OKAZAKI: J. C. S. Japan, 60(1939) 559.

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n-Dodecane

195 (1)  
 218 (1)  
 236 (2b)  
 308 (0)  
 349 (0)  
 397 (1)  
 421 (1)  
 453 (0)  
 487 (0)  
 724 (1)  
 749 (0)  
 772 (1b)  
 805 (1)  
 817 (1)  
 845 (2b)  
 872 (1)  
 893 (3)  
 919 (0)  
 931 (0)  
 955 (1)

964 (1)  
 1002 (0)  
 1032 (1b)  
 1061 (3)  
 1078 (3)  
 1100 (0)  
 1129 (3)  
 1159 (1)  
 1300 (6b)  
 1341 (1)  
 1369 (1)  
 1433 (7b)  
 1461 (5b)  
 2670 (6b)  
 2715 (0)  
 2750 (3b)  
 2849 (10)  
 2898 (6b)  
 2936 (8)  
 2964 (9b)

OKAZAKI: Loc. cit.

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ENCLOSURE (A)n-Cetane

199	(1)	1083	(4)
215	(2)	1082	(5b)
231	(1)	1108	(0)
278	(0b)	1132	(4)
330	(0)	1165	(0)
356	(0)	1304	(7b)
404	(1)	1314	(2)
450	(0)	1344	(0)
724	(1)	1368	(1)
742	(0)	1435	(8b)
762	(0)	1460	(6b)
784	(0)	2673	(0b)
808	(0)	2713	(2)
839	(2b)	2730	(3)
871	(2)	2748	(10b)
894	(3)	2885	(8b)
962	(1)	2937	(8b)
997	(0)	2965	(8b)
1015	(0)		

OKAZAKI: Loc. cit.

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2,3-Dimethyl butene-2,  
(From pinacene B.P. 72.5 - 73.5)

131	(2)	1215	(2)
404	(1)	1378	(2)
502	(1)	1447	(2)
602	(0)	1665	(2)
686	(1)	2775	(1)
894	(1)	2853	(4)
1017	(1)	2903	(7)
1145	(7)	2997	(1)

MORI: Sc. Pap. Inst. Chem. Ind. Res. (TOKYO) 25(1934) 31.

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Cyclopentane

215	(1)	1484	(1)
234	(8b)	2583	(1)
713	(1)	2686	(1)
867	(10b)	2887	(10b)
1087	(4b)	2899	(4)
1168	(0b)	2941	(7b)
1260	(1b)	2970	(6)
1444	(8b)		

OKAZAKI: J. C. S. Japan, 60(1939) 559.

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## ENCLOSURE (A)

## Cyclohexane

B.P. 80.7/760,  $d_4^{25}$  0.7734;  $n_D^{25}$  1.4250 (MATSUNO) (from KAGEHIRA)

202 (1)	1485 (1)
382 (3d)	2347 (1d)
425 (4)	2463 (1)
699 (2b)	2534 (1)
787 (1)	2552 (1)
784 (1)	2600 (1b)
802 (10)	2628 (2)
833 (1d)	2663 (5b)
1026 (8)	2697 (3)
1154 (4)	2762 (0)
1264 (8)	2850 (10)
1342 (3)	2885 (3)
1405 (0)	2898 (2)
1425 (1)	2920 (8)
1444 (10d)	2933 (8)
1465 (1)	

K. MATSUNO & K. HAN; Bull. Chem. Soc. Japan, 11(1936) 321; OKAZAKI Loc. cit.

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Methyl cyclohexane  $d_4^{20}$  0.7710;  $n_D^{20}$  1.4238.

307 (1)	1284 (3)
335 (0)	1305 (2)
405 (3)	1344 (3)
444 (4)	1362 (1)
545 (3)	1398 (0)
751 (0)	1440 (4)
768 (10)	1458 (4)
801 (0)	1495 (0)
844 (4)	2359 (0)
972 (3)	2467 (0b)
1031 (6)	2661 (2b)
1056 (1)	2719 (1)
1087 (26)	2850 (10b)
1162 (3)	2891 (1)
1201 (2)	2926 (5b)
1246 (2)	2957 (1)

OKAZAKI: J. O. S. Japan, 60 (1939) 589.

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## ENCLOSURE (A)

1.2. Dimethyl cyclohexane <sup>20</sup>d<sub>4</sub> 0.7862; <sup>20</sup>n<sub>D</sub> 1.4320.  
(cis.+trans-mixture)

140	(0b)	1004	(4)
280	(0)	1053	(3)
310	(0)	1104	(3)
330	(1)	1161	(3b)
414	(3)	1220	(3)
440	(0)	1255	(5)
469	(0)	1300	(2)
498	(3)	1317	(2)
536	(2)	1353	(2b)
592	(1)	1374	(0)
789	(1)	1443	(6)
748	(3)	1460	(4)
764	(0)	2662	(1)
799	(0)	2725	(0b)
819	(0)	2850	(10b)
841	(3)	2872	(3b)
852	(0)	2890	(3)
919	(0)	2925	(10b)
943	(3)	2960	(3b)
975	(3)		

OKAZAKI: J. C. S. Japan, 60 (1939) 551.

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1.3. Dimethyl cyclohexane <sup>20</sup>d<sub>4</sub> 0.7732; <sup>20</sup>n<sub>D</sub> 1.4260.

165	(0b)	1006	(0)
251	(0)	1057	(5)
352	(0)	1077	(0)
370	(0)	1106	(0b)
406	(0)	1165	(0b)
418	(3)	1180	(1)
449	(1b)	1219	(1)
485	(0)	1267	(2b)
543	(3)	1302	(1)
621	(0)	1347	(2b)
750	(3)	1439	(5)
789	(2)	1459	(5)
797	(0)	2666	(0)
828	(0)	2720	(0)
845	(0)	2841	(8)
856	(0)	2845	(8b)
934	(0)	2890	(3)
955	(0)	2925	(10b)
980	(3)	2957	(5b)

OKAZAKI: J. C. S. Japan, 60 (1939) 559.

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## ENCLOSURE (A)

1,4-Dimethyl cyclohexane  $d_4^{20}$  0.7753;  $n_D^{20}$  1.4269.

125 (1)	1186 (2)
250 (0b)	1205 (2)
374 (4)	1248 (3)
431 (0)	1263 (3)
453 (2)	1305 (2b)
472 (3)	1346 (4b)
635 (2)	1437 (4)
759 (10)	1460 (6)
787 (2)	2667 (1b)
926 (0)	2721 (1)
953 (3)	2745 (0)
974 (1)	2846 (10b)
1002 (1)	2869 (5b)
1060 (5b)	2928 (10b)
1097 (1b)	2955 (5b)
1165 (3)	

OKAZAKI: Loc. cit.

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benzene B.P. 80.5/760;  $d_4^{25}$  0.8728;  $n_D^{25}$  1.4992.

405 (1b)	1215 (0)
527 (0)	1405 (1)
606 (4)	1586 (3)
680 (0)	1605 (2)
800 (0)	2458 (1)
850 (3)	2512 (0)
907 (0)	2548 (1)
980 (2)	2925 (1)
992 (10)	2948 (4)
1007 (1)	3041 (5)
1036 (0)	3063 (8)
1148 (0)	3164 (2)
1176 (4)	3166 (3)

MIZUSHIMA, MORINO & OKAZAKI: J. C. S. Japan, 60 (1939) 289.  
 NISHIO: Jap. Jour. Phy. 4 (1930) 1.  
 MATSUMO & HAN: Bull. Chem. Soc. Japan, 11 (1936) 321.

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## ENCLOSURE (A)

Phenyl cyclohexane B.P. 92/5mm  $d_4^{25}$  0.9339;  $n_D^{25}$  1.5225 (from KAGEHIRA)

106 (2b)		1048 (4)
141 (1d) ?		1082 (3b)
157 (1d) ?		1121 (3b)
238 (1d)		1155 (6d)
277 (6)		1175 (4)
360 (1d) ?		1198 (5)
380 (1)		1229 (4)
411 (1)		1262 (4)
437 (2)		1281 (6)
460 (2)		1297 (1)
621 (6)		1328 (1d)
741 (1d)		1349 (1d)
773 (5)		1440 (5)
<del>827 (3)</del>		1574 (1b)
839 (1d)		1597 (6)
862 (3)		1608 (5)
894 (2d)		2698 (1)
925 (1) ?		2852 (4)
995 (10)		2932 (4)
1002 (10)		3062 (3)
1030 (6)		

K. MATSUMO & K. HAN: B. C. S. Japan, 11 (1936) 321.

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Dicyclohexyl B.P. 94/10mm  $d_4^{25}$  0.8653;  $n_D^{25}$  1.4820 (from KAGEHIRA)

102 (1d) ?		1038 (5b)
246 (1)		1063 (5)
318 (3b)		1118 (3d)
364 (1d)		1160 (3d)
435 (1)		1199 (2b)
460 (2)		1240 (2)
485 (2)		1267 (6d)
512 (1)		1351 (4)
766 (4)		1444 (6d)
787 (3)		1493 (1d)
801 (1)		2663 (1)
846 (5)		2833 (3)
<del>932 (1)</del>		2890 (2)
1002 (2)		2921 (5b)

K. MATSUMO & K. HAN: B. C. S. Japan 11 (1936) 321.

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ENCLOSURE (A)

Naphthalene

(in Alcohol)

513 (5)  
762 (5)  
1027 (3)  
1381 (10)  
1463 (5d)  
1581 (3)  
3070 (5d)

(in Benzene)

514 (6)  
764 (6)  
778 (1) ?  
1028 (4)  
1382 (8)  
1464 (4)  
1577 (4)  
3064 (8)

K. MATSUMO & K. HAN: B. C. S. Japan, 11(1936) 321.

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B.F. 71-72/6mm  $d_4^{25}$  0.966;  $n_D^{25}$  1.5410 (from KAGEHIRA)

Tetrahydro-naphthalene

117 (5d)  
164 (6b)  
267 (4d)  
318 (1d)  
436 (6)  
457 (4)  
511 (4b)  
585 (6)  
704 (3)  
728 (8)  
746 (1)  
766 (3)  
808 (3)  
822 (4d)  
872 (5)  
907 (2b)  
941 (2d)  
1040 (10)  
1071 (4)  
1117 (1d)  
1164 (6b)

1205 (8)  
1235 (3)  
1284 (3)  
1301 (3)  
1345 (4)  
1360 (4)  
1385 (5)  
1435 (6)  
1452 (3)  
1463 (3)  
1496 (1b)  
1583 (4)  
1602 (6)  
2674 (2b)  
2713 (2d)  
2866 (6)  
2885 (6)  
2914 (3d)  
2994 (6b)  
3029 (3d)  
3044 (5)

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## ENCLOSURE (A)

## Indene



B.P. 62/10mm  $d_4^{25}$  0.9813;  $n_D^{25}$  1.5755 (TAKEDA)  
 T. HAYASHI: Sc. Pap. Inst. Ph. Ch. Res., 23 (1933) 274.  
 Purified Kahlbaum Substance; (182-2.5) 768;  $d_4^{25}$  1.0001  $n_D^{20}$  1.580.

204 (3d)	1609 (10)
379 (2)	2890 (4)
391 (2)	3036 (2b)
532 (8)	3066 (3b)
591 (6d)	3113 (2d)
730 (10)	206 (6)
762 (3d)	351 (0)
830 (5d)	380 (5)
841 (2)	515 (5)
860 (5)	577 (5)
912 (11)	710 (5)
923 (1d)	737 (4b)
944 (5b)	821 (5)
1018 (10)	924 (5)
1067 (6)	1003 (6)
1110 (6b)	1049 (5)
1152 (3d)	1099 (7b)
1204 (10)	1144 (3)
1225 (6d)	1190 (7)
1285 (5)	1276 (7b)
1310 (5b)	1343 (6)
1359 (10)	1379 (6)
1394 (8d)	1443 (6)
1457 (10)	1534 (8)
1490 (2)	1589 (10)
1550 (10)	2766 (3)
1587 (5)	3036 (4b)

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## ENCLOSURE (A)

1,2, Dihydro-naphthalene

B.P. 74.0-74.5 (8mm) °  
 Hilger's constant deviation type dispersion 20 Å per mm near 4358 Å.  
 Plates: Ilford Hypersensitive Panchromatic Plate.

148 (5)	1143 (5)
199 (5)	1202 (5)
264 (5)	1259 (5b)
397 (4)	1280 (4)
466 (4)	1332 (4)
530 (4)	1375 (4)
567 (4)	1472 (4)
665 (4)	1554 (5b)
726 (4b)	1618 (6b)
787 (4)	2759 (2)
865 (4)	2814 (3)
933 (4)	2919 (3)
1020 (4b)	3026 (3b)
1091 (4)	

HAYASHI: So. Pap. Inst. Phy. Ch. Res. 23 (1933) 274.

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B.P. 63/9  $d_4^{25}$  Decahydro-naphthalene  
 0.8847;  $n_D^{25}$  1.4770 (from KAGEHIRA)

152 (1b)	1020 (3)
297 (0)	1047 (4)
329 (2a)	1060 (3b)
356 (2)	1150 (1)
381 (2)	1170 (2)
408 (5)	1236 (1)
442 (1a)	1249 (4)
491 (4)	1260 (4)
601 (4)	1275 (4)
751 (6)	1363 (4a)
759 (3a)	1369 (4a)
802 (3)	1432 (6b)
856 (5)	2661 (3a)
876 (3)	2837 (8b)
932 (1a)	2896 (4)
990 (5b)	2916 (5b)

K. MATSUNO & K. HAN: B. C. S. Japan, 11 (1936) 321.

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## ENCLOSURE (A)

## Tetrahydro-acenaphthene



B.P. 98/5mm  $d_4^{25}$  1.0115;  $n_D^{25}$  1.5582 (from KAGEHIRA)

130 (3)	1095 (4)
161 (6b)	1116 (3)
220 (6)	1128 (3)
250 (4d)	1157 (3)
381 (4)	1185 (3)
402 (2)	1222 (6d)
456 (7)	1250 (3)
507 (4d)	1278 (5d)
568 (8)	1338 (5d)
591 (8)	1432 (8)
607 (1) ?	1452 (6)
650 (10)	1609 (7d)
723 (1d)	2490 (1d) ?
764 (2)	2593 (1) ?
<del>799 (3)</del>	2639 (1) ?
826 (1)	2666 (3b)
858 (2)	2840 (7b)
872 (1)	2856 (2)
939 (1)	2940 (8b)
953 (3)	3045 (5d)
1030 (5)	3069 (1d) ?
1061 (6)	

K. MATSUNO & K. HAN. Buell. Ch. Soc. Japan, 11 (1936) 321.

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## Decahydro-acenaphthene



B.P. 80/5  $d_4^{25}$  0.9456;  $n_D^{25}$  1.5016 (from KAGEHIRA)

177 (2d)	1096 (6b)
326 (1)	1161 (0)
356 (3)	1212 (1) ?
372 (2d)	1236 (2)
432 (2)	1289 (5b)
498 (3d)	1371 (8b)
515 (1d)	1448 (8d)
547 (4)	1481 (4d)
595 (1)	2600 (1)
620 (3)	2662 (3d)
<del>722 (6)</del>	<del>2677 (2) ?</del>
764 (4)	2697 (2)
804 (1)	2742 (2d)
854 (3d)	2761 (2d) ?
910 (2)	2851 (4b)
950 (4)	2823 (4)
1025 (4)	2922 (6b)
1068 (6b)	2942 (6b)

K. MATSUNO & K. HAN: Bull. Ch. S. Japan, 11 (1936) 321.

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## ENCLOSURE (A)

## Decahydro-pyrene



B.P. 160/5  $d_4^{25}$  1.0553;  $n_D^{25}$  1.5782 (from KAGEHIRA)

158 (2b)		1221 (5)
318 (1d) ?		1281 (10)
389 (2b)		1315 (2)
412 (0d)		1339 (1)
525 (2)		1361 (3d)
557 (1)		1435 (6b)
587 (2b)		1579 (1d)
614 (1)		1604 (3d)
642 (0d) ?		2826 (4)
810 (0) ?		2861 (2b)
891 (4)		2934 (5b)
1061 (6b)		3085 (3)
1097 (6b)		

K. MATSUNO & K. HAN: Bull. Chem. Soc. Japan, 11 (1936) 321.

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## Perhydro-pyrene



B.P. 164/10  $d_4^{25}$  0.9875;  $n_D^{25}$  1.5225 (from KAGEHIRA)

261 (1d)		1009 (1)
294 (1)		1032 (1)
322 (2)		1056 (4)
351 (3)		1092 (3)
372 (2d)		1148 (4b)
420 (4b)		1169 (3b)
486 (4b)		1217 (1)
464 (4b)		1229 (4d)
490 (1)		1248 (3d)
532 (1)		1291 (1b)
563 (3)		1327 (0)
634 (1b)		1348 (1)
678 (1d)		1397 (4b)
743 (4)		1444 (4d)
790 (2)		2220 (3)
833 (2)		2253 (5)
868 (2)		2912 (4b)
969 (1) ?		2936 (4b)

K. MATSUNO & K. HAN: Bull. Chem. Soc. Japan, 11 (1936) 321.

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## ENCLOSURE (A)

Gedrene B.P. 116-7/10mm n<sub>D</sub><sup>30</sup> 1.4943.  
Dehydration of Gedrol.  
(see Bull. So. 9 (1934) 327)

87	(2b)		938	(6b)
124	(0d)	?	985	(5b)
144	(4b)		986	(3d)
189	(3b)		1001	(5d)
237	(1d)		1024	(2)
260	(4b)		1038	(3)
(288)	(0)		1066	(6)
308	(4)		(1087)	(2)
317	(3)		1105	(2d)
340	(1)		1127	(5b)
(364)	(2)		1143	(6b)
389	(3b)		1167	(6b)
410	(3)		1201	(6b)
437	(2d)		1219	(2)
454	(2d)		1237	(5b)
491	(3)		1275	(5)
532	(5)		1297	(5)
571	(8)		1325	(2d)
587	(4)		1360	(5)
611	(4)		1375	(5)
650	(2)		1434	(8)
656	(3)		1452	(8)
698	(3)		1475	(6b)
733	(8b)		(1646)	(1)
780	(8)		1666	(10)
802	(2)		2850	(2b)
819	(6)		2875	(2)
(833)	(1)		2915	(6b)
850	(4b)		2937	(6b)
(875)	(1d)		2967	(6b)
916	(8b)		3030	(2d)

K. MATSUMO: Bull. Chem. Soc. Japan, 10 (1935) 220.

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## ENCLOSURE (A)

B.P. 120-3/12mm <sup>d<sub>4</sub></sup> 0.92386: n<sub>4</sub><sup>1</sup> 1.4883 <sup>a</sup> p-86.31°  
 Sesquichamens  
 Leaves Arisan Hinoki Chamaecyperis obtusa, Siebe. Zucc. of  
 Formosana Hayata (K. KAFUKU & T. NOZOE, B. C. S. Japan 6(1931) 111.

91 (3b)	1022 (1d)
132 (3b)	1042 (2)
254 (3d)	1058 (2)
280 (3)	1100 (3b)
302 (2d)	1119 (3b)
336 (2d)	1155 (6b)
360 (5d)	1186 (1)
<del>386 (5d)</del>	<del>1192 (4)</del>
407 (1)	1208 (1)
434 (4)	1263 (4)
496 (3)	1296 (4)
539 (3)	1322 (2b)
572 (3)	1348 (2)
590 (8)	1375 (4)
604 (4)	1398 (4)
684 (1)	1434 (5)
770 (6)	1453 (4d)
814 (5)	1471 (4)
843 (1d)	1647 (1)
882 (4b)	1680 (10)
907 (4d)	2844 (4b)
926 (1d)	2868 (3b)
934 (2)	2908 (6b)
954 (4)	2966 (2b)
964 (4)	3006 (5b)
988 (1d)	3084 (1)
1006 (4)	3167 (4)

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B.P. 162° <sup>d</sup> 17.5 <sup>d</sup> Sabinosa <sup>n<sub>20</sub></sup> 1.4621 <sup>a</sup> D + 72  
 Leaves Arisanhinoki (K. KAFUKU, T. NOZOE & C. HATA, B. C. S. 6 (1931) 40.

120 (3b)	1031 (5)
189 (2b)	1067 (4)
214 (1)	1109 (6b)
306 (3)	1145 (4d)
333 (1)	1170 (3d)
362 (3d)	1197 (6)
373 (1)	1214 (1d)
441 (3)	1270 (4b)
491 (1d)	1308 (4b)
509 (3)	1379 (3d)
566 (2)	1415 (8)
634 (3d)	1430 (4d)
655 (5)	1447 (5d)
785 (5)	1468 (4d)
<del>808 (4d)</del>	<del>1656 (10b)</del>
866 (4b)	2830 (4)
882 (2d)	2913 (2)
915 (6d)	2940 (2)
930 (1)	2964 (6)
954 (6b)	2996 (4b)
969 (3)	3070 (4b)

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ENCLOSURE (A)

$\alpha$ -d<sub>4</sub> Pinene   $d_{20}^{20} + 45.25$   
 B.P. 155-6  $d_4^{20} 0.8585$ ;  $n_D^{20} 1.4671$ ;  $[\alpha]_D^{20} + 45.25$   
 Root-oil, CHAMAECYPARIS OBTUSA SIEBE. Zucc. of Formosana Hayata (HINOKI)

134 (3b)	1042 (3d)
208 (2b)	1085 (3)
261 (3d)	1125 (2)
306 (2d)	1163 (4)
333 (0)	1183 (3b)
388 (3b)	1223 (3b)
426 (2)	1264 (4b)
485 (2)	1308 (2)
488 (3)	1328 (3b)
564 (4)	1374 (3d)
620 (3)	1433 (5d)
667 (6)	1444 (3b)
774 (4)	1468 (2)
822 (2)	1660 (6)
844 (5)	2833 (4d)
885 (1)	2874 (4b)
905 (3)	2912 (5b)
930 (1)	2951 (3b)
953 (3b)	2988 (5d)
998 (0)	3031 (4b)
1015 (1d)	

K. MATSUNO & K. HAN. Bull. Ch. Soc. Japan, 11 (1936) 576.

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