

thenes were studied; 1 : 2 dihydroxyacenaphthene (II), for example, is inactive.

It would seem reasonable to suppose that *c*-mitotic activity in this type of compound requires the attachment of the acenaphthene derivative to some protein-like substrate at both the 'bridge' and the 5-6-positions of the nucleus. Substitution by hydrophilic groups could cause the molecule to lift away from the substrate at either of these points, with loss of activity. Working on this assumption, we have synthesized alcohols containing a 5-acenaphthyl group, and have tested their *c*-mitotic activity against onion root-tips (Feulgen staining). 5-acenaphthyl carbinol (I, $R = \text{CH}_2\text{OH}$) was inactive, the alcohol group being coplanar with the acenaphthene nucleus. No activity was observed with 2-(5-acenaphthyl) ethanol (I, $R = \text{CH}_2\text{CH}_2\text{OH}$) but with the corresponding acenaphthylpropanol (I, $R = \text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$) and acenaphthyl butanol (I, $R = \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$) *c*-mitotic activity was once more observed. This took the typical forms of 'clumped' chromosomes, over-contraction of chromosomes and 'stickiness' of chromosomes. In such compounds the activity may depend on the ability of the side-chain to 'bend' away from the substrate so that the hydrophilic group is able to enter more effectively the surrounding aqueous phase, and the hydrocarbon nucleus can remain attached as though it were unsubstituted. Free rotation about the C—C bonds of the side-chain would just make this possible in 5-acenaphthyl ethanol, but the distance of the hydroxyl group from the nucleus is presumably too small to permit the required orientation.

Previous workers have pointed out the inhibition of root growth by naphthalene and acenaphthene and their derivatives, and we have found that both the active alcohols referred to above are exceedingly potent growth-inhibitors, much more effective than acenaphthene in this respect.

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¹ Schmuck, A., *C.R. Acad. Sci., U.S.S.R.*, **19**, 189 (1938).

² Navashin, M., *C.R. Acad. Sci., U.S.S.R.*, **19**, 193 (1938).

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Qualitative Analysis of Hydrocarbons by Pyrolysis and Gas Chromatography

A RECENT paper by Dhont¹ has described the application of pyrolysis to the detection of benzene rings in organic compounds, the pyrolysis products being analysed by gas chromatography. He suggests that the technique may be generally useful for identification of small amounts of material, for example, those separated by gas chromatographic columns.

In work to be published later, the pyrolysis products of a variety of hydrocarbons have been examined by gas chromatography. In all cases so far examined, it has been found that a simple relation exists between the starting material and the products and this allows the former to be characterized. For example, it is possible to differentiate between isomeric paraffins. In Table 1, the principal pyrolytic products of 2,2- and 2,3-dimethylbutane (DMB) are listed, together with the approximate amounts formed. Pyrolysis was performed in an unpacked quartz tube at 500° C. upstream from a squalane on firebrick column and hydrogen flame ionization detector.

Table 1. PRINCIPAL PYROLYTIC PRODUCTS OF 2,2- AND 2,3-DIMETHYLBUTANE

Product	Approximate weight (per cent)	
	2,2-DMB	2,3-DMB
Propylene	1	10
Butene-1/isobutene	10	3
3-Methyl butene-1	nil	0.5
2-Methyl butene-1	3	trace
2-Methyl butene-2	11	16

Carbon-carbon bond fissions of these two molecules would be expected to lead to the products shown as follows :

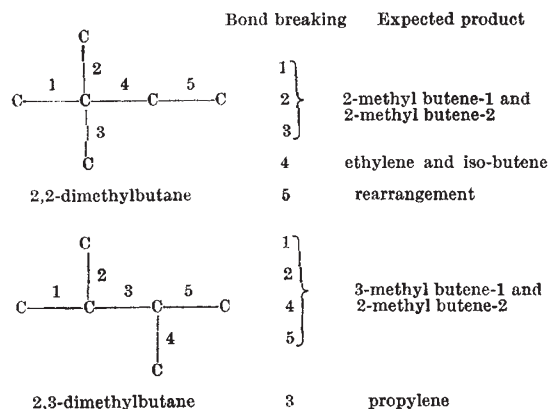


Table 1 shows that the expected products do in fact occur and enable a distinction to be drawn between the isomers. Other similar relationships have been found, and it is believed that the basis of a scheme of qualitative analysis exists which will be of especial value in the field of hydrocarbon identifications above C_{10} . Distinctions are also to be found between paraffins and naphthenes which may be exploited to get hitherto unobtainable information on the composition of saturate hydrocarbon fractions.

A vital distinction between this work and that of Dhont is that no packing is used in the reactor. Catalytic effects are thus excluded whereas with a packing like 'Chromosorb' the deposition of cracked or polymerized material on the surface could well change its properties, leading to unrepeatable pyrolysis patterns unless the packing was replaced after every analysis.

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