

Citation:

Romburgh, P. van, On some further constituents of the essential oil of Kaempferia Galanga L., in: KNAW, Proceedings, 4, 1901-1902, Amsterdam, 1902, pp. 618-620

In this nitrated chloride the position of the nitrogroup is known, as it is also formed from o.-nitrotoluene.

I have prepared the corresponding amides by acting with mono-methyl- and monoethylamine on this. 2. nitrotoluene. 4. sulphochloride. By treatment with nitric acid the methylamide gave the above mentioned nitroparatoluenesulphomethylnitramide melting at 116° and the ethylamide gave the analogous ethyl compound melting at 76°.

During the action of nitric acid on the alkylated amides of paratoluenesulphonic acid, the reactions in regard to the amido-group are analogous to those observed in the case of benzenesulphonic acid; a nitrogroup, however, readily enters the nucleus and occupies the ortho position in regard to the CH₃. Consequently 2. nitrotoluene. 4. alkylnitramide sulphonates are also formed.

An extensive communication on the numerous compounds obtained during this investigation will shortly appear elsewhere. I intend to state on a future occasion the results of the action of nitric acid on the two other isomers of toluenesulphonic acid.

Chemistry. — Dr. P. VAN ROMBURGH: "*On some further constituents of the essential oil of Kaempferia Galanga L.*" (Communicated by Prof. FRANCHIMONT).

(Communicated in the meeting of February 22, 1902.)

On May 26th 1900, I had the honour to present to the Academy a communication on the ethyl ester of p.-methoxycinnamic acid, the chief constituent of the essential oil of *Kaempferia Galanga L.* (Kentjoer, Mal.). Since then, I have continued the investigation of the liquid portion of that oil and tried in the first place to identify the nature of the second acid which I had found in it. Its purification, when contaminated with p.-methoxycinnamic acid, is not an easy matter and it must be recrystallised many times from water and alcohol before obtaining a product with a constant melting point (133°) which proved to be cinnamic acid. The acid may be more readily obtained pure by distilling the liquid essential oil in vacuum and saponifying the fraction boiling at 155°—165° (at 30 m.m.). The acid thus obtained at once showed the right melting point.

The alcohol formed during the saponification of that fraction proved to be ethyl alcohol so that the Kentjoer oil consists to a large extent

(about a quarter of its volume) of ethyl cinnamate. VON MILLER¹⁾ has found the same ester in liquid storax.

The isolation of the pure ester from Kentjoer oil is very difficult as it is accompanied by a few other products one of which is very indifferent and has nearly the same boiling point. An effort to isolate the ethyl cinnamate (m.p. 12°) by cooling failed, for when placed in ice nearly the whole of the mass congealed which is no matter for astonishment, as it afterwards appeared that the indifferent admixture melts at 10°.

If the fraction boiling at 155°—165° (at 30 m.m.) is treated with 80 percent alcohol, this dissolves the ester while the other compound floats on the alcoholic solution. By repeating this treatment a few times, I succeeded in obtaining an already fairly pure ester which was still further purified by partial freezing. A quantitative saponification and an elementary analysis showed, however, that it was still contaminated with a compound richer in carbon and hydrogen which also somewhat decreased the specific gravity. The odour and the boiling point, however, were the same as those of a specially prepared specimen of ethyl cinnamate. The compound readily absorbed bromine but before the required amount has been taken up the liquid assumes a splendid violet colour²⁾ which on further addition of bromine becomes green.

The portion of the essential oil insoluble in alcohol which also turns violet with bromine was freed from small quantities of ethyl cinnamate by heating with alcoholic potassium hydroxide which became dark coloured and, consequently, the treatment was repeated a few times. After distillation of the purified oil a colourless liquid was obtained which turned the plane of polarisation 7° to the left, when using a tube of 200 m.m. Placed in ice, it solidified to leaf-shaped crystals melting at about 8° which, however occluded some liquid product. By draining the crystals and remelting them a liquid was obtained which turned only — 5.5°. The further purification would not have given much trouble on a cold winter day in Europe but in the vapour-saturated air of the tropical climate it has taken much patience and labour to finally obtain by the freezing process a liquid which only feebly turned the plane of polarisation and hardly turned green with bromine. To obtain it still purer it was treated with a solution of bromine in chloroform

1) Ann. d. Chemie 188, 203; VAN ITALLIE, Ned. Tijdschr. v. Pharm. 13, 103.

2) This reaction reminds of that for myrrh.

until coloured yellow; after removal of the chloroform it was washed with alcohol and aqueous potassium hydroxide and finally distilled in vacuum. The distillate showed a feebly green colour which disappeared by shaking the liquid with a little concentrated sulphuric acid which became dark in colour. In this way was finally obtained an inactive, colourless and odourless liquid which boils at 267.5° (738 mm), solidifies completely when placed in ice and melts at 10° . Its sp. gr. taken with the Westphal balance at 26° was 0.766. The elementary analysis and cryoscopic determination (in phenol) agree with that of a hydrocarbon of the composition $C_{15}H_{32}$.

Of hydrocarbons with this empirical formula only one is known, namely normal pentadecane prepared by KRAFFT¹⁾ the physical constants and properties of which agree in a remarkable manner with those of the described substance and I, therefore, do not hesitate to declare it identical with the hydrocarbon isolated from the essential oil of *Kaempferia Galanga*. It constitutes more than one-half of the liquid portion of the oil.

I hope to communicate within a reasonable time the results of the investigation of the compound which turns violet with bromine, of the terpene present in the essential oil and of a substance reminding of borneol, after I shall have again at my disposal larger quantities of the essential oil which is now being prepared.

I have to thank Dr. LONG who has assisted me in this investigation with much zeal and patience.

Mathematics: — “*On series of Polynomials*” 2nd part. By PROF. J. C. KLUYVER.

(Communicated in the meeting of March 29, 1902).

4. To the region of convergence of series VII for $\tan^{-1}x$ the greatest possible extension can be given by making a approach unity. Then the region G_1 is transformed into a band limited by two parallel lines through the two singular points $+i$ and $-i$, the common direction of which is entirely determined by the argument of $a-1$. Now we will examine how, still by application of the auxiliary function

$$g(u) = \frac{(a-1)a}{a-u},$$

the region G_1 is formed, when an arbitrary function $F(x)$ characterised

¹⁾ Berl. Ber. 15, 1700.