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Bandoeng, im September 1933.

Botany. — *A Study of the dark colored Duramen of Ebony.* By K. GRIFFIOEN. (Communicated by Prof. G. VAN ITERSON Jr.).

(Communicated at the meeting of October 28, 1933.)

The publication of my preliminary results is prompted by the announcement of Mr. WEDEKIND's paper on a similar subject at the "Herbsttagung der nordwestdeutschen Chemiedozenten" to be held at Cologne at the end of this month.

I made use of the powdered duramen of an Ebony-species (Gjaja merah = Diospyros spec.).

The analysis yielded the following results: moisture 7.75 %, ashes 0.6 %, cellulose 43.3 %, lignin (containing the coloring matter) 39.6 %, calculated on a dry basis.

A larger quantity of coloring matter was isolated in the following way. Treatment with $^2/_3$ n. *NaOH* yielded a dark brown fluid; concentrated hydrochloric acid gave a gelatinous precipitate in the filtrate. This precipitate was assembled by decantation and filtration, washed free from acid and slowly dried in air and with absolute ether. A brown amorphous powder was obtained, which had the following characteristics:

1. The powder was soluble in alkalies and trichloracetic acid, almost not soluble in ethylalcohol, insoluble in water, ether, and acids.

2. Fusion with potassium hydroxide yielded substances with a phenolic nucleus, such as phloroglucinol, pyrocatechol and protocatechuic acid.

3. By treating the powder with an alcoholic nitric acid mixture a nitro-compound was obtained. In a dry state it was a yellowish brown amorphous

powder, soluble in alcohol, acetone, glacial acetic acid, alkalies and in a one percent solution of sodium fluoride; it was insoluble in ether and benzene.

4. Elementary analysis gave: C 60.5 % and H 4.1 %.

5. It was observed that with acetylbromide only a very small part of the brown matter may be dissolved.

All these properties agree with those of *ulmic acids*, as we meet them in the literature, and also with those of the ulmic acids isolated by me from brown coal and from "Kasseler Braun" (which consists for a great part of these acids).

Conclusion: A large part of the coloring matter of ebony wood consists of *"ulmic acids"*.

Microchemical examination of sections of ebony wood convinced me that in this wood the transition of the alburnum into the duramen is accompanied by a transformation of lignin into ulmic substances.

The duramen of this wood contains brown ulmic acids within the medullary ray cells and within the wood parenchyma. The libriform fibres and the vessels of this part of the wood contain a black substance, insoluble in alkalies, only partly oxidisable by alcoholic nitric acid, which substance very probably may be regarded as to be decarboxilised ulmic acids ("huminen").

The alburnum does not contain these black ulmic substances.

On the other hand all the cell walls in the alburnum give very intensive lignin reactions, while these reactions are very feeble for the cell walls in the duramen. The latter give positive cellulose reactions.

These facts seem to indicate that the lignin in the cell walls of the alburnum is oxidised, and deposited within certain cells of the duramen. A part of this ulmic acid may be afterwards decarboxilised.

I may here refer to the investigations on the formation of ulmic substances in nature from dead plant material (the first stage of fossilification). This process seems to take place under the influence of microbes (see for instance W. GROSSKOPF, Ueber die Umwandlung des Lignins in Huminesäuren und Humine bei der Bildung von Humus und Braunkohlen aus Nadelholzresten, Brennstoff-Chemie **7**, 293—299, 1926).

Also by this process ulmic substances — at first ulmic acid which afterwards may be decarboxilised — originate (partly or exclusively) from lignin.

Ulmification and fossilification seem to be analogous, if not identical processes and the case described seems the more curious as we meet here with ulmification in a probably sterile environment.

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Summer, 1933.