

Gattermann Synthesis of Aldehydes

THE observation was made recently that hydrogen cyanide promotes the growth of certain fungi¹, which indicates the increased activity of the enzymes present in such circumstances. Earlier findings, on the other hand, had had some bearing on the mechanism of the mixed Cannizzaro reaction². Investigations are now being carried out in this laboratory, in an attempt to contribute toward the elucidation of the mechanism of the Gattermann synthesis of aldehydes³.

These experiments involve an adaptation of the original technique, using aluminium chloride, sodium cyanide (both chemically pure and "Aero Brand"), a solvent belonging to one of several series of hydrocarbons, and dry hydrogen chloride. They have already proved the practicability of this method⁴. The yields thus far obtained are evidenced by some data presented in the table below.

At the same time, the use of solvents belonging to homologous series has already outlined the basis of a rule relating the position of a given solvent in such a series to the yields obtained. The table, illustrating the results of an average series of trials, will serve to exemplify the latter point:

Formula of solvent	Name	C-atoms in side chain	Average yield %
PhH	Benzene	0	11
PhCH ₃	Toluene	1	20
PhCH ₂ CH ₃	Ethylbenzene	2	38
PhCH(CH ₃) ₂	Cumene	3	24
PhCH(CH ₃)(C ₂ H ₅)	sec.-Butylbenzene	4	3.5
PhC(CH ₃) ₂ (C ₂ H ₅)	tert.-Amylbenzene	5	7.5

Further investigations are in progress along several lines (including the influence of directive substituents), with a view toward clarifying some of the less evident features of the Gattermann synthesis.

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¹ Dammann, E., Rotini, O. T., and Nord, F. F., *Biochem. Z.*, **297** 192 (1938). *Ergebn. Enzymforsch.*, **8**, 179 (1939).

² Nord, F. F., *Beiträge z. Physiol.*, **2**, 301 (1924); *Chem. Rev.*, **3**, 65 (1926).

³ Gattermann, L., *Ber. deut. chem. Ges.*, **31**, 1149 (1898).

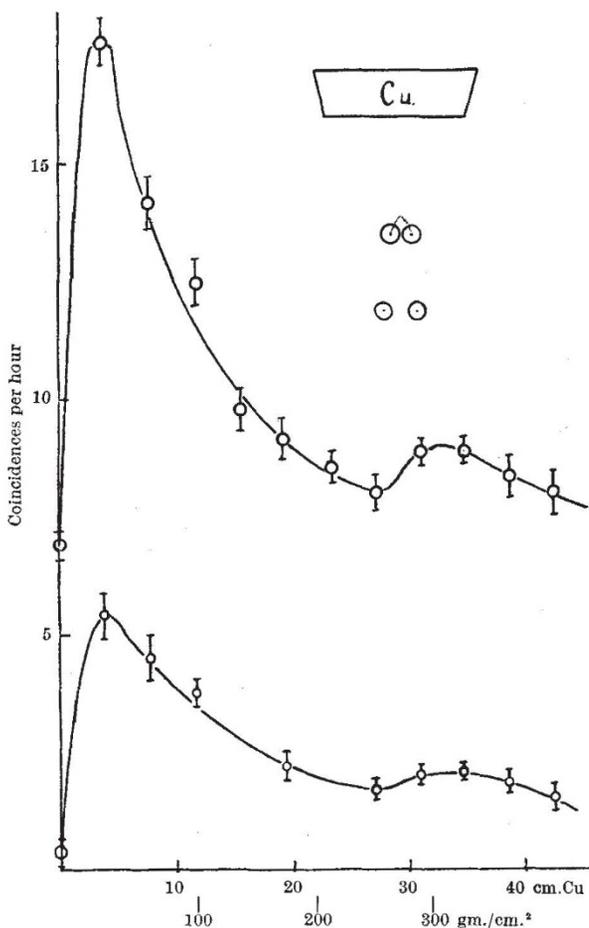
⁴ cf., however, Montgomery, E., and Adams, R., *J. Amer. Chem. Soc.*, **45**, 1518 (1924).

The Second Maximum in the Rossi Transition Curve for Copper

K. SCHMEISER and W. Bothe found a pronounced second maximum in the transition curve for cosmic ray secondaries from large thicknesses of lead. This maximum became the more pronounced the smaller the angle subtended by the counters at the absorber. W. Morgan and K. Nielson, on the other hand, found no indications of a second maximum for a counter arrangement similar to that employed by Schmeiser and Bothe, with the exception that the two upper counters were not joined together, while a rather similar curve to that of Schmeiser and Bothe was obtained when the upper counters were linked together. In this case the background rate was very

much increased. This appears to show that the relatively high count under large thicknesses is connected with a high background rate.

In view of the fact that these two experiments are not in harmony, it was considered worth while to investigate the small-angle showers under large thicknesses of material, both when the upper counters are joined and when they count separately. The absorber used was copper, the angle subtended by the counter system at the absorber 6°. The curves obtained in the two cases are shown in the accompanying graph. When the upper counters were connected the background rate was certainly increased very much, but the characteristics of the curves remained essentially the same at large thicknesses. Both show a marked second maximum.



In the case where the upper counters work separately, and fourfold coincidences are counted, the number of counts without copper is very small, that is, the background rate is very small. Threefold coincidences, with the upper counters joined, show, on the other hand, a large background rate. The conclusion is that it is not the background rate which is responsible for the relatively high count at large thicknesses, but the secondaries from the material placed above the counters.

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