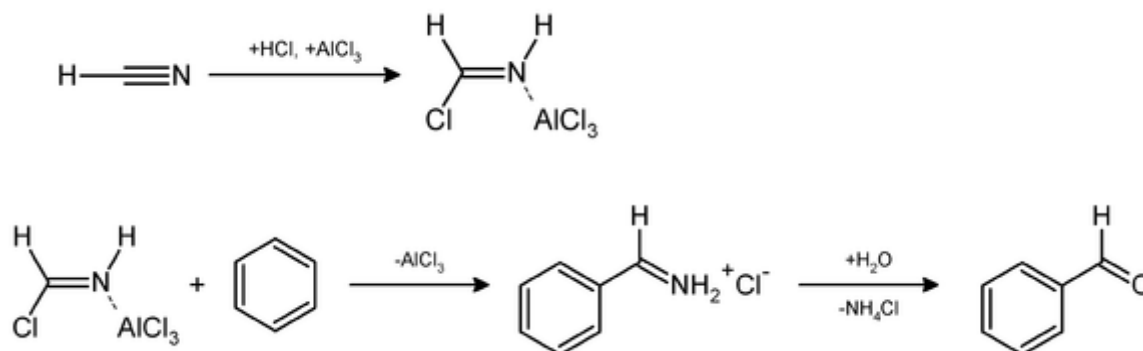


Gattermann reaction

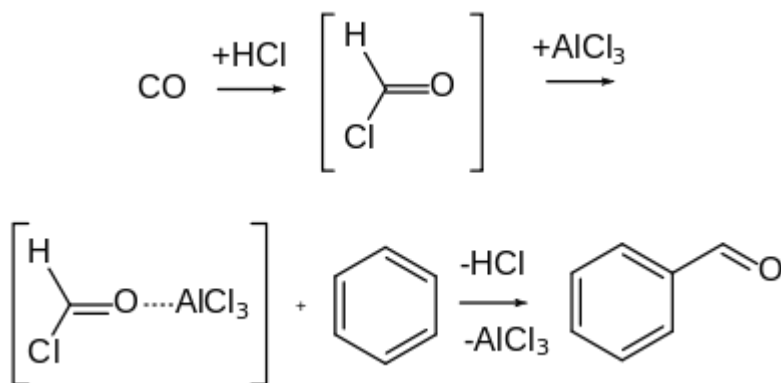
The **Gattermann reaction**, (also known as the **Gattermann formylation** and the **Gattermann salicylaldehyde synthesis**) is a chemical reaction in which aromatic compounds are formylated by a mixture of hydrogen cyanide (HCN) and hydrogen chloride (HCl) in the presence of a Lewis acid catalyst such as AlCl₃. It is named for the German chemist Ludwig Gattermann^[1] and is similar to the Friedel–Crafts reaction.



The reaction can be simplified by replacing the HCN/AlCl₃ combination with zinc cyanide.^[2] Although it is also highly toxic, Zn(CN)₂ is a solid, making it safer to work with than gaseous HCN.^[3] The Zn(CN)₂ reacts with the HCl to form the key HCN reactant and Zn(CN)₂ that serves as the Lewis-acid catalyst *in-situ*. An example of the Zn(CN)₂ method is the synthesis of mesitaldehyde from mesitylene.^[4]

Gattermann–Koch reaction

The **Gattermann–Koch reaction**, named after the German chemists Ludwig Gattermann and Julius Arnold Koch,^[5] is a variant of the Gattermann reaction in which carbon monoxide (CO) is used instead of hydrogen cyanide.^[6]



Unlike the Gattermann reaction, this reaction is not applicable to phenol and phenol ether substrates.^[3] Although the highly unstable formyl chloride was initially postulated as an intermediate, formyl cation (i.e., protonated carbon monoxide), [HCO]⁺, is now thought to be react directly with the arene without the initial

Gattermann formylation	
Named after	<u>Ludwig Gattermann</u>
Reaction type	<u>Substitution reaction</u>
Identifiers	
RSC ontology ID	<u>RXNO:0000139</u>

Gattermann–Koch formylation	
Named after	<u>Ludwig Gattermann</u> <u>Julius Arnold Koch</u>
Reaction type	<u>Substitution reaction</u>

formation of formyl chloride.^[7] Additionally, when zinc chloride is used as the catalyst, or when the carbon monoxide is not used at high pressure, the presence of traces of copper(I) chloride or nickel(II) chloride co-catalyst is often necessary. The transition metal co-catalyst may server as a "carrier" by first forming reacting with CO to form a carbonyl complex, which is then transformed into the active electrophile.^[8]

See also

- Houben–Hoesch reaction
- Stephen aldehyde synthesis

References

1. Gattermann, L.; Berchermann, W. (1898). "Synthese aromatischer Oxyaldehyde" (<https://zenodo.org/record/1425914>). *Berichte der deutschen chemischen Gesellschaft*. **31** (2): 1765–1769. doi:10.1002/cber.18980310281 (<https://doi.org/10.1002%2Fcber.18980310281>).
2. Adams R.; Levine, I. (1923). "Simplification of the Gattermann Synthesis of Hydroxy Aldehydes". *J. Am. Chem. Soc.* **45** (10): 2373–77. doi:10.1021/ja01663a020 (<https://doi.org/10.1021%2Fja01663a020>).
3. Adams, Roger (1957). *Organic Reactions, Volume 9*. New York: John Wiley & Sons, Inc. pp. 38 & 53–54. doi:10.1002/0471264180.or009.02 (<https://doi.org/10.1002%2F0471264180.or009.02>). ISBN 9780471007265.
4. Fuson, R. C.; Horning, E. C.; Rowland, S. P.; Ward, M. L. (1955). "Mesitaldehyde". *Organic Syntheses*. doi:10.15227/orgsyn.023.0057 (<https://doi.org/10.15227%2Forgsyn.023.0057>); *Collective Volume, 3*, p. 549
5. Gattermann, L.; Koch, J. A. (1897). "Eine Synthese aromatischer Aldehyde" (<https://zenodo.org/record/1425872>). *Chemische Berichte*. **30** (2): 1622–1624. doi:10.1002/cber.18970300288 (<https://doi.org/10.1002%2Fcber.18970300288>).
6. Li, Jie Jack (2003). *Name Reactions: A Collection of Detailed Reaction Mechanisms* (<https://books.google.com/books?id=6mZJ3084ouAC&pg=PA157&lpg=PA157&dq=%22gattermann+koch%22+reaction>) (available on Google Books) (2nd ed.). Springer. p. 157. ISBN 3-540-40203-9.
7. Kurti, Laszlo. (2005). *Strategic Applications of Named Reactions in Organic Synthesis : Background and Detailed Mechanisms* (<https://www.worldcat.org/oclc/850164343>). Czako, Barbara. Burlington: Elsevier Science. ISBN 978-0-08-057541-4. OCLC 850164343 (<https://www.worldcat.org/oclc/850164343>).
8. Dilke, M. H.; Eley, D. D. (1949). "550. The Gattermann–Koch reaction. Part II. Reaction kinetics" (<http://xlink.rsc.org/?DOI=JR9490002613>). *J. Chem. Soc.* **0** (0): 2613–2620. doi:10.1039/JR9490002613 (<https://doi.org/10.1039%2FJR9490002613>). ISSN 0368-1769 (<https://www.worldcat.org/issn/0368-1769>).

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