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# **Toluene, the Xylenes and their Industrial Derivatives**

EDITED BY

E.G. HANCOCK

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**E.G. HANCOCK, M.A., M.Sc., F.R.S.C.**

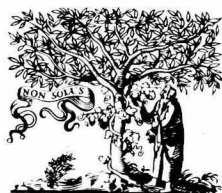
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# **Toluene, the Xylenes and their Industrial Derivatives**

## CHEMICAL ENGINEERING MONOGRAPHS

Edited by Professor S.W. CHURCHILL, Department of Chemical Engineering,  
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(Hancock, editor)



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## PREFACE

This volume continues a series of books dealing with hydrocarbons of industrial importance. Dr. S.A. Miller's monumental work of acetylene was followed by his edited volume on ethylene and then, due to his untimely death, further works on propylene, ethylene and the C<sub>4</sub> hydrocarbons which I edited. All of these were published by Ernest Benn, except for the last which was published in the form of a Microfiche by Benn in conjunction with the Oxford Microform Company. They all cover in considerable detail the principal industrial derivatives of which the above hydrocarbons form the starting materials.

The present volume follows the now traditional style. Specialists were invited to write the separate chapters and this had resulted in the usual unavoidable lack of uniformity. Some authors have gone into more detailed chemistry than others while certain contributors gave more attention to the end uses of the first line products. The contributor to one of the chapters, that on solvents, was unable to complete his work due to serious family illness and the chapter has been edited by the writer with the assistance of various friends in industry, particularly Mr. D.R. Clarke of B.P. Chemicals.

There are some inevitable overlaps. Thus benzaldehyde can be prepared either by oxidation or chlorination of toluene; so the product is discussed in both the chlorination and the oxidation chapters. Sulphonic acids and sulphonamides have been discussed in the chapters on sulphonation and saccharin while the latter compound is also dealt with in the chapter on phthalic anhydride which is a raw material used in one process. Terephthalic acid (and dimethyl terephthalate) while normally produced from p-xylene can also be produced from toluene and hence its production appears in more than one chapter. Cross references have been included wherever possible while every attempt has been made to render the index comprehensive.

All contributors were encouraged to incorporate statistics while a separate chapter provides a general review of production and end use figures. Unfortunately, owing to the time factor, it has not been possible to incorporate fully up-to-date figures but they do at least

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indicate past trends, though in the present industrial climate such information is of less value than **formerly**.

Although the broad applications of toluene have been very fairly discussed in Chapter 1, there have been recent developments which should be taken into account when assessing the prognostications given in that chapter. Thus, the gradual reduction in the quantity of tetra-alkyl lead in gasoline, now made compulsory in the U.K. and which is in various stages of reduction in other countries, would appear greatly to increase the demand for toluene. On the other hand new specifics have been developed with an anti-knock value higher than toluene; e.g. methyl t.-butyl ether and tertiary butyl alcohol. Bulk plants for the manufacture of the former have been under construction for some time and may be in operation before this book appears. There has always been a small production of tertiary butyl alcohol as a by-product. The value of toluene in gasoline will therefore depend on the cost and availability of these new specifics as well as the speed at which the reduction or elimination of the lead content of gasoline proceeds.

At the present time the demand for toluene is very small for chemical uses compared with its consumption in gasoline and its use as a raw material for the production of benzene. Nevertheless it is a very versatile chemical and this alone justifies a book of this type.

Xylenes have really only two major outlets, phthalic anhydride and terephthalic acid or dimethyl terephthalate and these uses are each given major chapters in this book. But with the present recession in trade of products from these base chemicals it is probable that more xylenes will become available for motor gasoline, particularly as one means of replacing lead. Their relatively low volatility will mean that the composition of the gasoline blend may need adjustment to ensure easy starting with the current types of car.

It was decided not to include coal-tar chemicals as such. So chapters on the detailed applications and properties of mixed cresols and xylenols have not been included nor have synthetic methods of preparing the latter as toluene or xylene are not the normal starting materials.

There are three groups of persons for whom this book should prove to be of special use:

- (1) Students wishing to study industrial chemistry in some depth;
- (2) Personnel working in a marketing department, perhaps newly appointed, wishing to gain some background information in the products and their uses in different industries;
- (3) Research workers given a project within the scope of the



material in this book would find the latter very useful for obtaining background information and some important references.

I should like to thank all contributors for the chapters they have written and hope that their efforts will provide a book which, together with its companion volumes, will supply a valuable source of information on industrial hydrocarbon chemistry.

August 1981

E.G. Hancock

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