

STUDY ON ACRIDINE WITH REFERENCE TO PROPERTIES

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ABSTRACT

Many acridines, such as proflavine, also have antiseptic properties. Acridine and related derivatives bind to DNA and RNA due to their abilities to intercalate. Acridine was first isolated in 1871 by Carl Gräbe and Heinrich Caro. Many synthetic processes are known for the production of acridine and its derivatives. Acridine occurs naturally in coal tar. It is separated from coal tar by extracting with dilute sulfuric acid

Keywords Acridine derivatives, Dyes, DNA, RNA, Acridophosphine, chrysaniline, chrysaniline And Oxidation.

INTRODUCTION

Acridine, C₁₃H₉N, is an organic compound and a nitrogen heterocycle. Acridine is also used to describe compounds containing the C₁₃N tricycle. Acridine is structurally related to anthracene with one of the central CH groups is replaced by nitrogen. Acridine, a colorless solid, was first isolated from coal tar. It is a raw material used for the production of dyes and some valuable drugs. Many acridines, such as proflavine, also have antiseptic properties. Acridine and related derivatives bind to DNA and RNA due to their abilities to intercalate. Acridine orange (3,6-dimethylaminoacridine) is a nucleic acid-selective metachromatic stain useful for cell cycle determination. Acridarsine is formally derived from acridine by replacing the nitrogen atom with one of arsenic, and acridophosphine by replacing it with one of phosphorus.

REVIEW OF LITERATURE

Acridine was first isolated in 1871 by Carl Gräbe and Heinrich Caro. Acridine occurs naturally in coal tar. It is separated from coal tar by extracting with dilute sulfuric acid; addition of potassium dichromate to this solution precipitates acridine bichromate. The bichromate is decomposed using ammonia. A classic method for the synthesis of acridones is the Lehmstedt-Tanasescu reaction.

MATERIAL AND METHOD

Acridine and its homologues are stable compounds of weakly basic character. Acridine has a pK_a of 5.6, which is similar to that of pyridine. It also shares properties with quinoline which is the single fused homologue. Acridine crystallizes in needles which melt at 110 °C. It is characterized by its irritating action on the skin, and by the blue fluorescence shown by solutions of its salts. Acridine combines readily with alkyl iodides to form alkyl acridinium iodides, which are readily transformed by the action of alkaline potassium ferricyanide to *N*-alkyl acridones.

On oxidation with potassium permanganate it yields acridinic acid $C_9H_5N(COOH)_2$ or quinoline-1,2-dicarboxylic acid. Acridine is easily oxidized by peroxymonosulfuric acid to the acridine amine oxide. The carbon 9-position of acridine is activated for addition reactions. The compound is reduced to the 9,10-dehydroacridine and reaction with potassium cyanide gives the 9-cyano-9,10-dehydro derivative.

Numerous derivatives of acridine are known and may be prepared by methods analogous to those used for the formation of the parent base. 9-Phenylacridine is the parent base of chrysaniline or 3,6-diamino-9-phenylacridine, which is the chief constituent of the dyestuff phosphine (not to be confused with phosphine gas), a by-product in the manufacture of rosaniline.

Chrysaniline forms red-coloured salts, which dye silk and wool a fine yellow; and the solutions of the salts are characterized by their fine yellowish-green fluorescence. Chrysaniline was synthesized by O. Fischer and G. Koerner by condensing ortho-nitrobenzaldehyde with aniline, the resulting ortho-nitro-para-diamino-triphenylmethane being reduced to the corresponding orthoamino compound, which on oxidation yields chrysaniline.

Benzoflavin, an isomer of chrysaniline, is also a dye-stuff, and has been prepared by K. Oehler from meta-phenylenediamine and benzaldehyde. These substances condense to form tetra-aminotriphenylmethane, which, on heating with acids, loses ammonia and yields 3,6-diamino-9,10-dihydrophenylacridine, from which benzoflavin is obtained by oxidation. It is a yellow powder, soluble in hot water.

RESULT

Acridine is a known human carcinogen. It causes frameshift mutations in incorporating into the DNA, and doing so creating an additional base on the opposite strand. If that mutation occurs in a coding sequence, it almost always leads to inactivation of the protein it encoded.

CONCLUSIONS

Many synthetic processes are known for the production of acridine and its derivatives. A. Bernthsen condensed diphenylamine with carboxylic acids, in the presence of zinc chloride in the Bernthsen acridine synthesis. With formic acid as the carboxylic acid the reaction yields acridine itself, and with the higher homologues the derivatives substituted at the meso carbon atom are generated.

Other older methods for the organic synthesis of acridines include condensing diphenylamine with chloroform in the presence of aluminium chloride, by passing the vapours of orthoaminodiphenylmethane over heated litharge, by heating salicylic aldehyde with aniline and zinc chloride to 260 °C or by distilling acridone (9-position a carbonyl group) over zinc dust.

A general method for acridine synthesis is the cyclisation of *N*-phenylanthranilic acid or 2-(phenylamino) benzoic acid with phosphoric acid.

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