

REVIEW ON ISATIN (PREPARATION, REACTIONS, BIOLOGICAL APPLICATIONS, BIO-USES)

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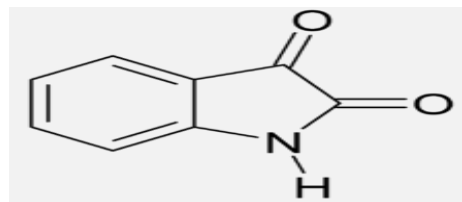
ABSTRACT

This Review touched on the Bio-chemical compound known as isatin, which is known for its Bio-importance and properties in many well-known drugs and pharmacies, as it is considered a basic substance in many bio- compounds and the basic nucleus in bacterial, fungicidal antibodies to its composition derived from the heterocyclic compound indole. Also this survey involved alternative method of preparation ,reactions ,some of its applications in many fields like in drugs, in bacteriology field ,other Bio-applications.

KEYWORDS: Isatin, Indole, cyclic compound, Biological ,biocompound.

INTRODUCTION

Isatin is known as **tribulin**, also it is an organic chemical compound came from indole cycle(formula $C_8H_5NO_2$). The compound was first produced by researcher (Otto L. with Auguste L.) in 1840 as a result of the oxidation of indigo compound -dye by acid (HNO_3) with chromic acids. Isatin is a well-branded natural compound that can be appeared in plants of the genus Isatis, in *Couroupitaguianensis*, and also in humans, as a metabolic derivative of adrenaline. It looks like an color (red-orange) powder, also it is usually hired as building block to the synthesis of a wide variation of biologically active organic compounds containing anti-cancers , antivirals, anti-HIVs, besides to anti-tuberculars.



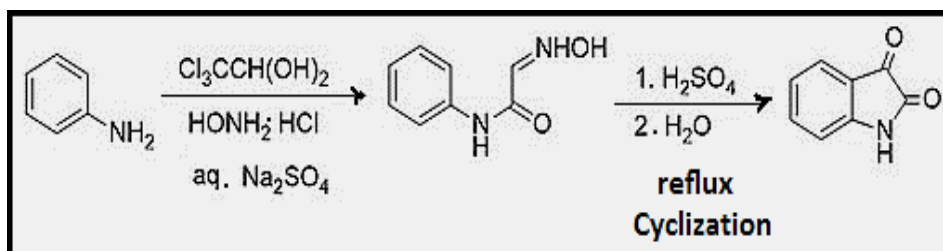
Structure of Isatine

Other Names of Isatin:

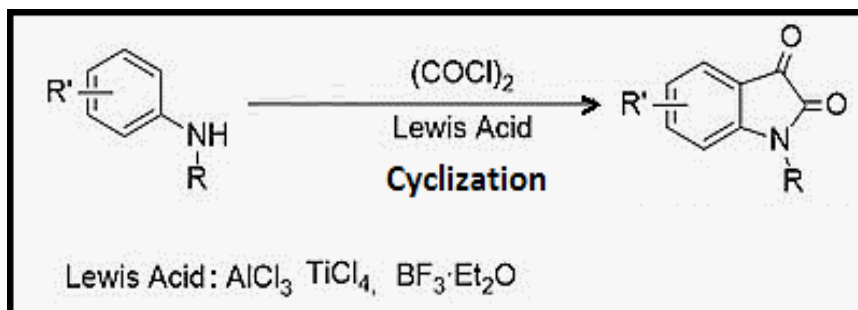
- a) Indoline-2,3-dione
- b) 1H-indole-2,3-dione
- c) Indole-2,3-dione
- d) Isatin
- e) 2,3-Dihydro-1H-indole-2,3-dione

PREPARATION METHODS OF ISATIN:**1. By Sandmeyer Method**

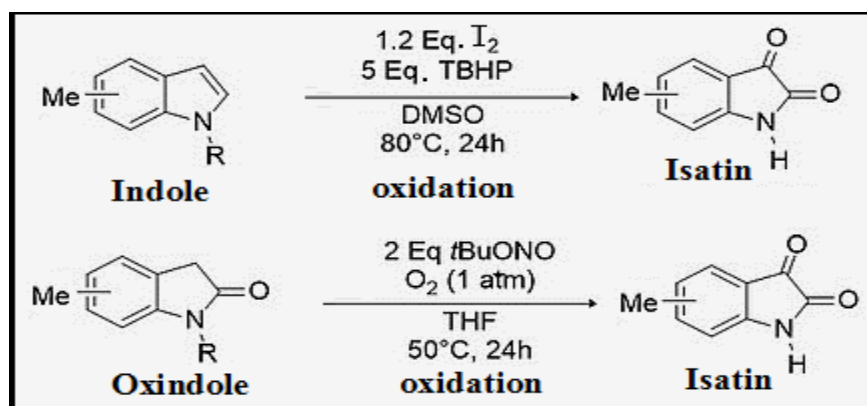
This method represented by Sandmeyer reaction is the oldest, straightforward process for the production of isatin. The method contains the refluxing process via condensation reaction between ([chloral hydrate](#)) with (aromatic amine-as a primary amine like: [aniline](#)), in presence of catalysis like ([hydroxylamine hydrochloride](#)) in [sodium sulfate](#) (Na_2SO_4) to form Imine compound then isolation of this intermediate flowed by cyclization reaction with strong acids (like: [sulfuric acid](#)):

**2. By Stolle Method:**

This method represented by Stolle reaction is considered the best alternative method to Sandmeyer reaction of the preparation of each substituted and un-substituted isatins. In this method (primary aryl-amine or secondary aryl-amines) are used with ([oxalyl chloride](#)) to form a (chlorooxalylanilide)- intermediate that can then cyclization reaction in the presence of a [Lewis acid](#) (like: [aluminum tri-chloride](#), [titanium tetrachloride](#), [boron tri-fluoride](#),).

**3. Other Alternative Procedures:**

There are variety methods to syntheses Isatin as alternative methods like: oxidation of Indole or Oxindole by various oxidizing catalysis represented by ([TBHP](#), [IBX-SO3K](#), [tBuONO](#), ...):

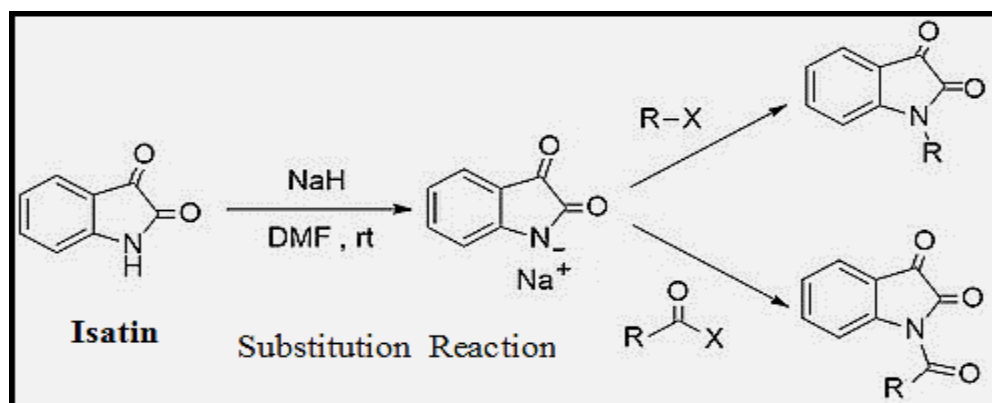


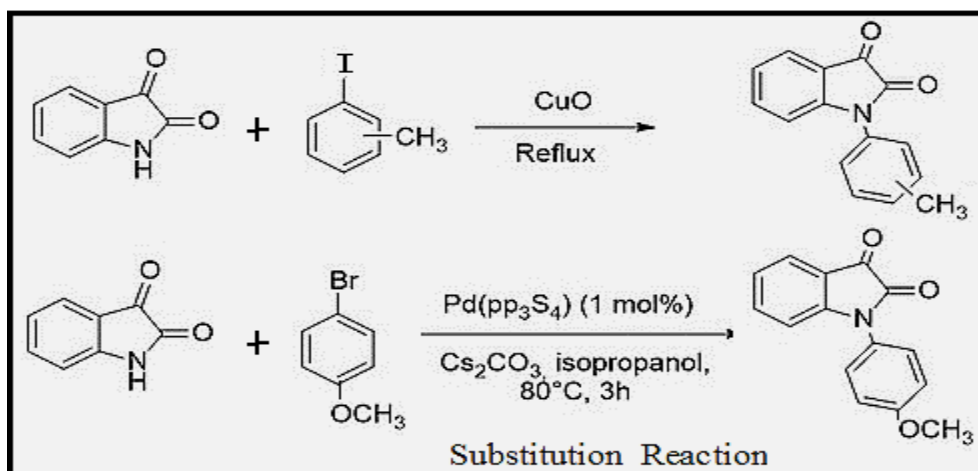
REACTIONS OF ISATIN:

The presence of (a [ketone](#) and a γ -[lactam](#)) - moiety on an [aromatic ring](#) gave to isatin the rare potential to be used as each an [electrophile](#) and a [nucleophile](#): indeed ((it can react in various substitutions- reaction like : [electrophilic aromatic substitution](#) at positions (C-5 and C-7) of the phenyl ring) besides to [nucleophilic additions](#) onto the (C-3) [carbonyl group](#), also in ([reductions](#), [oxidations](#))-reactions, [ring-expansions](#) :

1. N-Substitution Reaction:

The reaction occurs by substitution of (H) of the isatin via the [de-protonation](#) process of the amino moiety, then addition of an [electrophile](#) (like : alkyl or acyl [halides](#),):

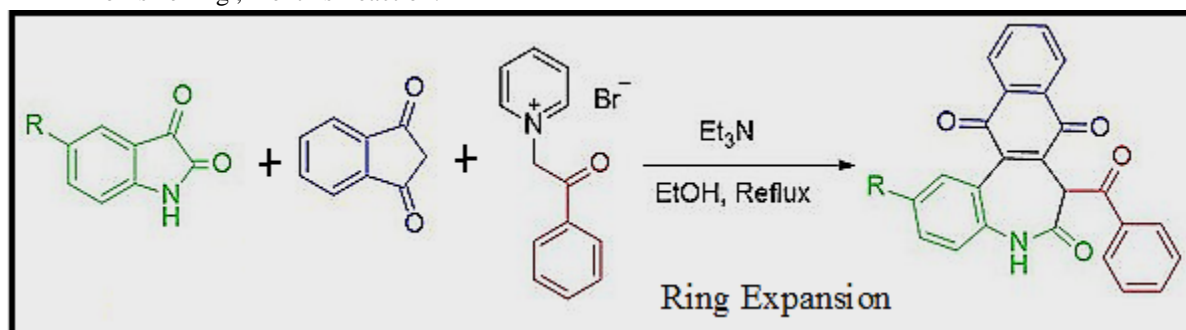




2. Ring Expansion Reaction:

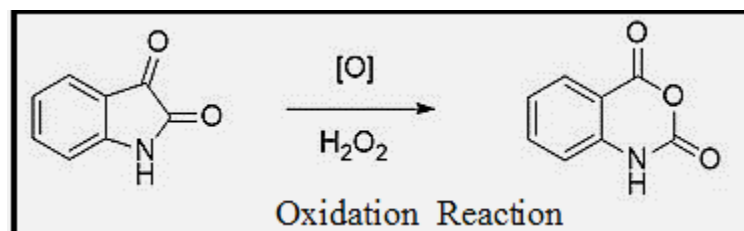
Ring Expansion reaction acts one of important reactions in organic chemistry, it occurs in isatin by increasing

of size ring, like this reaction:



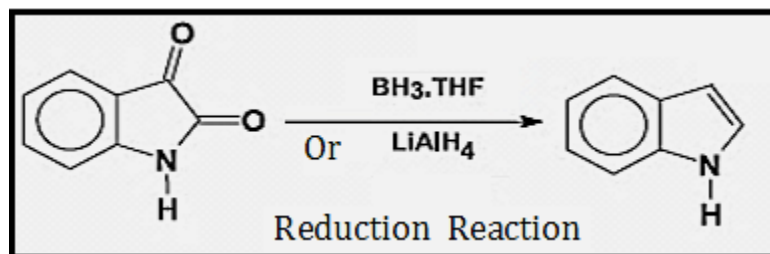
3. Oxidation Reaction:

The oxidation process occurs by using oxidizing agents like (H_2O_2 , CrO_3 , ...) to give [isatoic anhydride](#) :



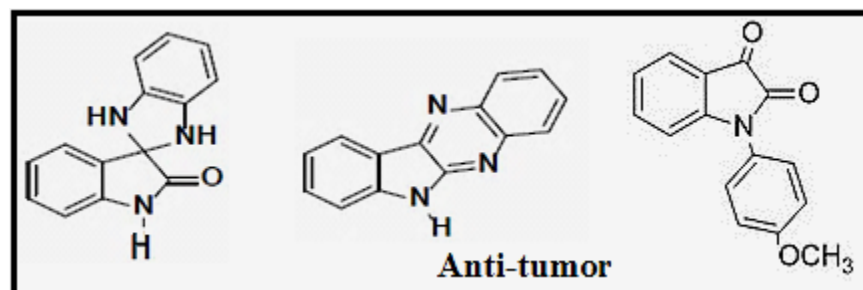
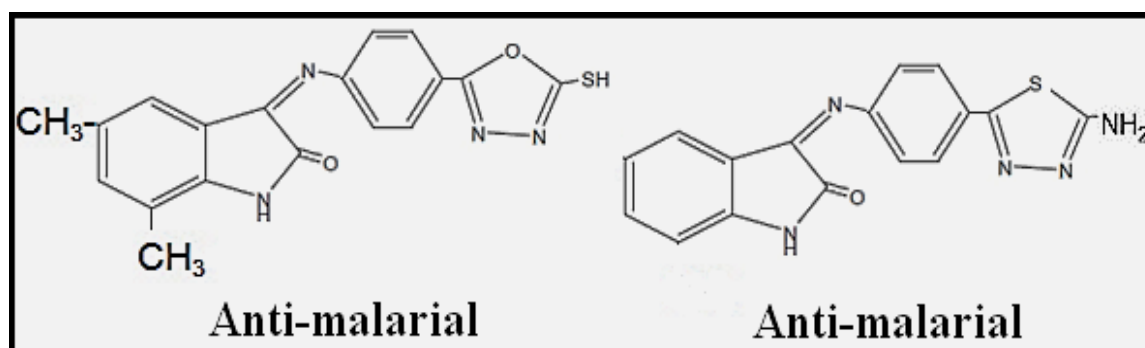
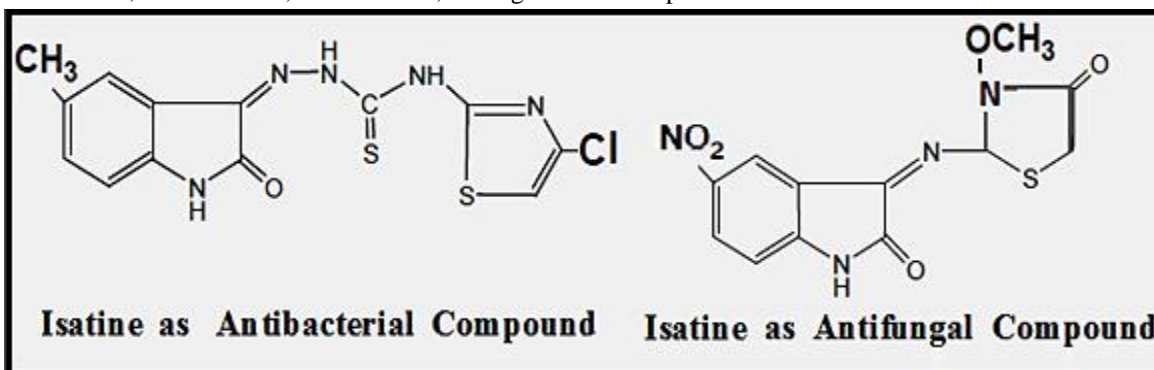
4. Reduction Reaction Or :

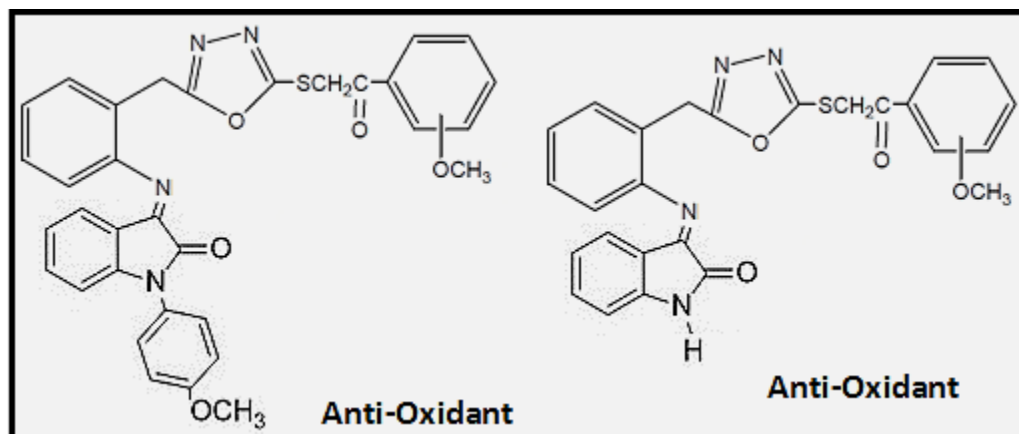
The reduction process occurs by using reduction agents like (BH_3 , LiAlH_4 , ...):



BIOLOGICAL APPLICATIONS OF ISATIN DERIVATIVES :

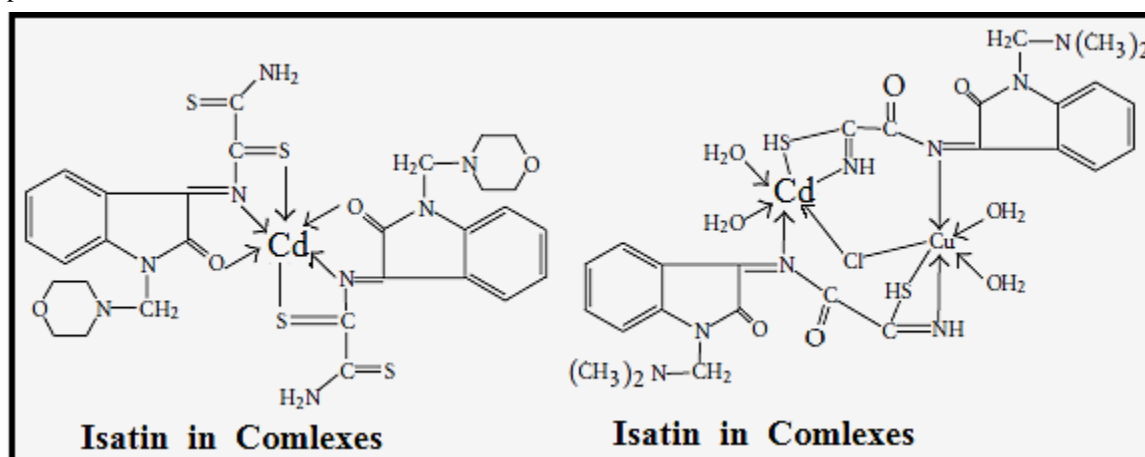
Isatin has a wide-spectrum importance in several areas, as it is included in the synthesis of many compounds that have demonstrated high biological effectiveness in the field of bacteria and fungi, including the compounds below, and also some of them were involved in the preparation of many anti-tumor materials and types of cancer cells, anti-malarial, antioxidants, as a ligands in complexes and others.





Chemical Applications of Isatin:

Isatin derivatives used as a ligands in many complexes with ions like with cadmium, copper, mercury, palladium, zinc and other ions:



CONCLUSION:

Isatin derivatives are synthetically **important** substrates, which can be used for the Formation of a large diversity of heterocyclic derivatives, and as raw material for drug creation., its metabolites are constituents of many natural substances. They are also components of many synthetic compounds exhibiting a wide range of effects.

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