Review in Effect of Catalysis in Any Organic Reaction

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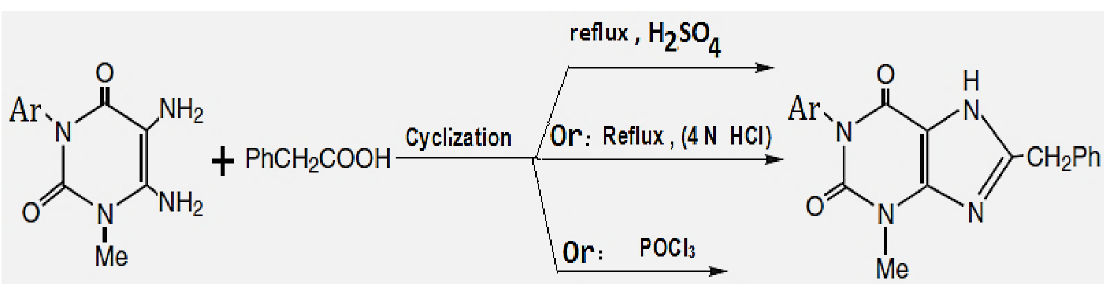
ABSTRACT

This review involved effect of catalysts on any chemical reaction, any reaction proceeds because the reaction products are more stable than the reactants and starting materials. The un catalyzed reaction is slow. In fact, simplest example: the decomposition of hydrogen peroxide is so slow that hydrogen peroxide solutions are commercially available. This reaction is strongly affected via catalysts like manganese dioxide, or the enzyme peroxidase in organisms, reduction and oxidation reactions.

***Keywords**: catalysts, catalysis, organic reaction, reduction*

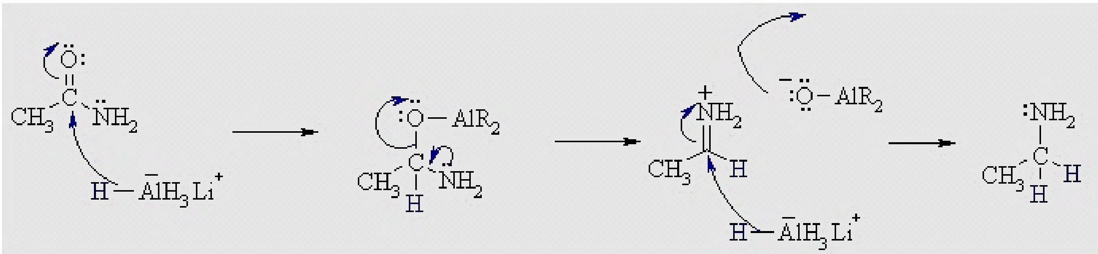
I . INTRODUCTION

Catalysis is the process of increasing the rate of a chemical reaction via adding a substance known as a catalyst. Catalysts are not consumed in the catalyzed reaction while can act repeatedly. Often only very small amounts of catalyst are required., In general, chemical reactions occur faster in the presence of a catalyst because the catalyst provides an alternative reaction pathway- or mechanism- with a lower activation energy than the non-catalyzed mechanism. In catalyzed mechanisms, the catalyst usually reacts to form intermediate, which then regenerates the original catalyst in a process



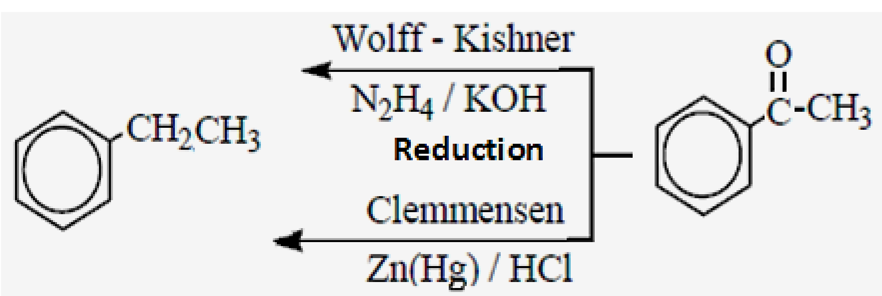
Reduction and Oxidation Catalysts :

- Amides (**RCONHR**) can be reduced to the amine (**RCH_2NHR**) by conversion of the carbonyl **(C=O)** to methyl group (-**CH_2**-).
- Amides can be reduced with $LiAlH_4$ to amine :



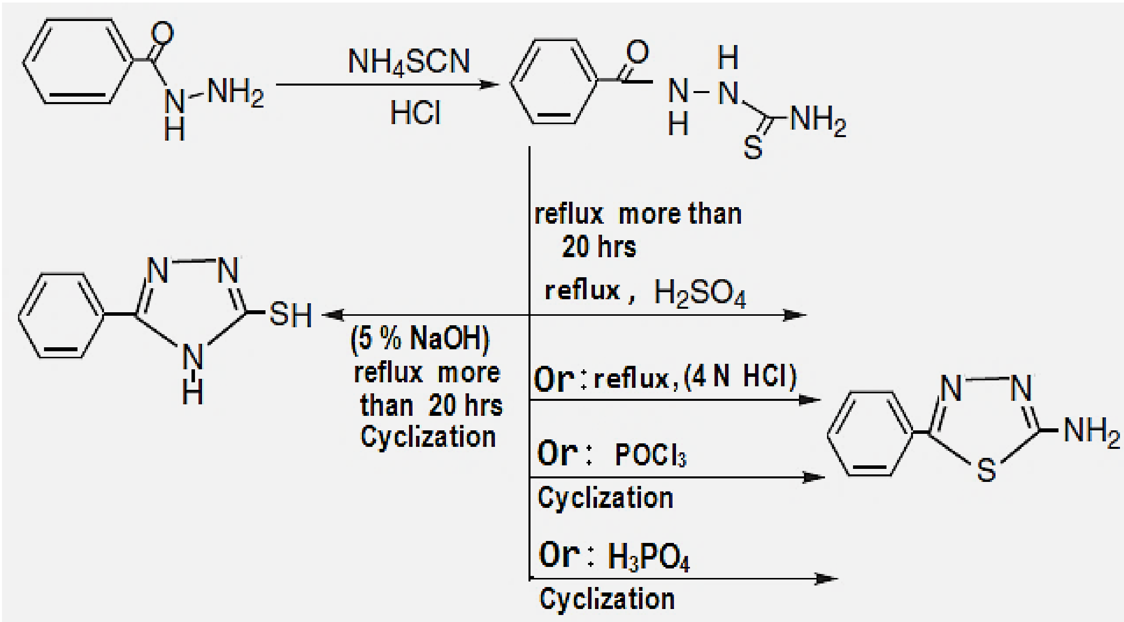
- Reduce carbonyl group to Alkanes (**Zn /Hg , HCl**).
- Reduce carbonyl group to Alkanes (**$Na_2Cr_2O_7$, HCl , Δ).**
- Substitute a carboxylic group on a aromatic compound to for a methyl group by (**$NaNO_2$, HCl**).
- **Fe** (Iron metal) to reduce nitro group to amines in the presence of an acid like (HCl).
- Hydrogen gas (**H_2**)is used to the reduction of alkenes, alkynes with catalysts like **(Pd and Pt**).
- Chromic acid (**H_2CrO_4**) is a strong acid and an oxidant (oxidize secondary alcohols to ketones and primary alcohols to carboxylic acids
- Hydrogen peroxide (**H_2O_2**) to (oxidize aldehydes to carboxylic acids.
- (**$KMnO_4$**)Potassium permanganate , which used to oxidize primary alcohol and aldehyde to carboxylic acid while secondary alcohol to ketone.
- **$LiAlH_4$** (Lithium aluminum hydride) is a very strong reducing reagent. It used to reduce ((aldehydes, ketones, esters, and carboxylic acids to alcohols)) while ((amides and nitriles to amines)).
- Sodium borohydride(**$NaBH_4$**) is a reagent for the reduction of ketones and aldehydes.
- **(Sn)** or (**Zn**) with acid, used to reduce nitro groups to amines.
- (**Zn - Hg**) with acid, zinc amalgam used to reduce ketones alkanes (Clemmensen reaction).

In general, chemical reactions occur faster in the presence of a catalyst because the catalyst provides an alternative reaction pathway - or mechanism - with a lower activation energy than the non-catalyzed mechanism. In catalyzed mechanisms, the catalyst usually reacts to form a intermediate, which then regenerates the original catalyst in a process., There are more than reduction methods like :

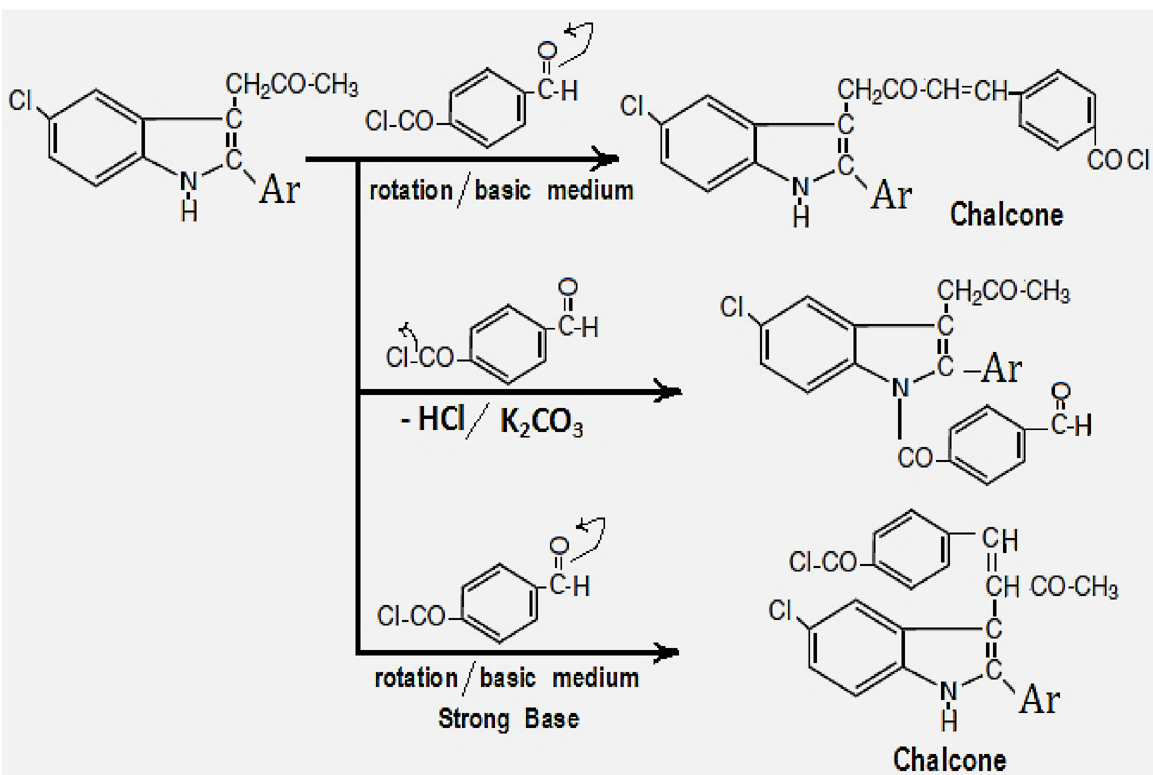


II. TYPES OF CATALYSTS:

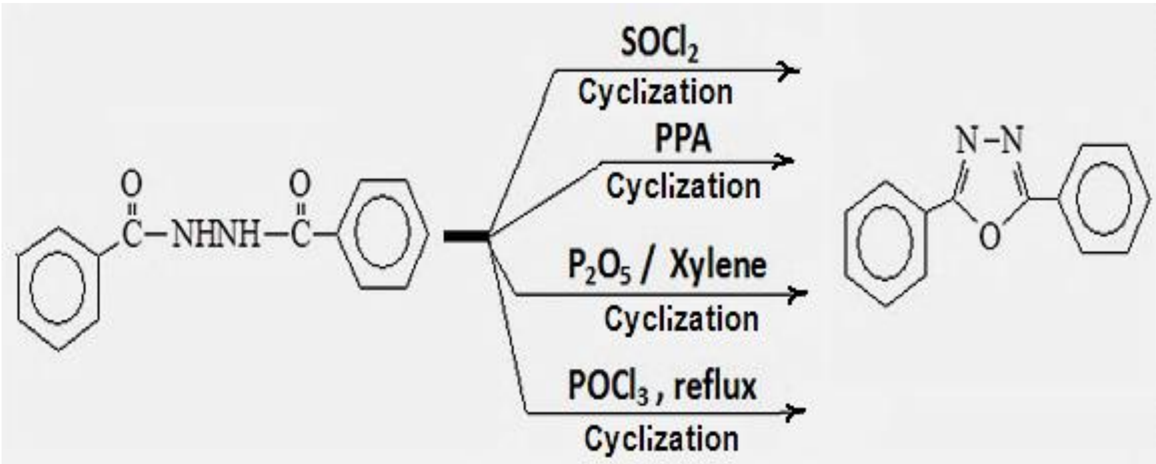
There are varous catalysis give same product but in different conditions like the reaction of carbonylhydrazine with ammonium thiocyanate followed by cyclization reaction via many methods like (dehydration with sulfuric acid ., 5N of HCl ., acidic medium with H_3PO_4 .,or in basic medium in 5 % of NaOH solution) .



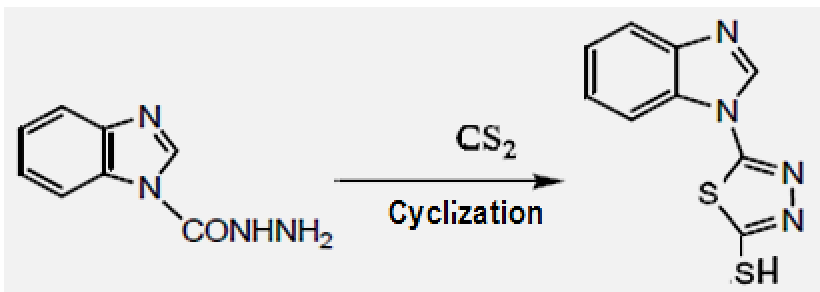
Other reaction involves two active group in same compound ,carbonyl of aldehyde and carbonyl of Aroyl halide, the product depends on catalysis:



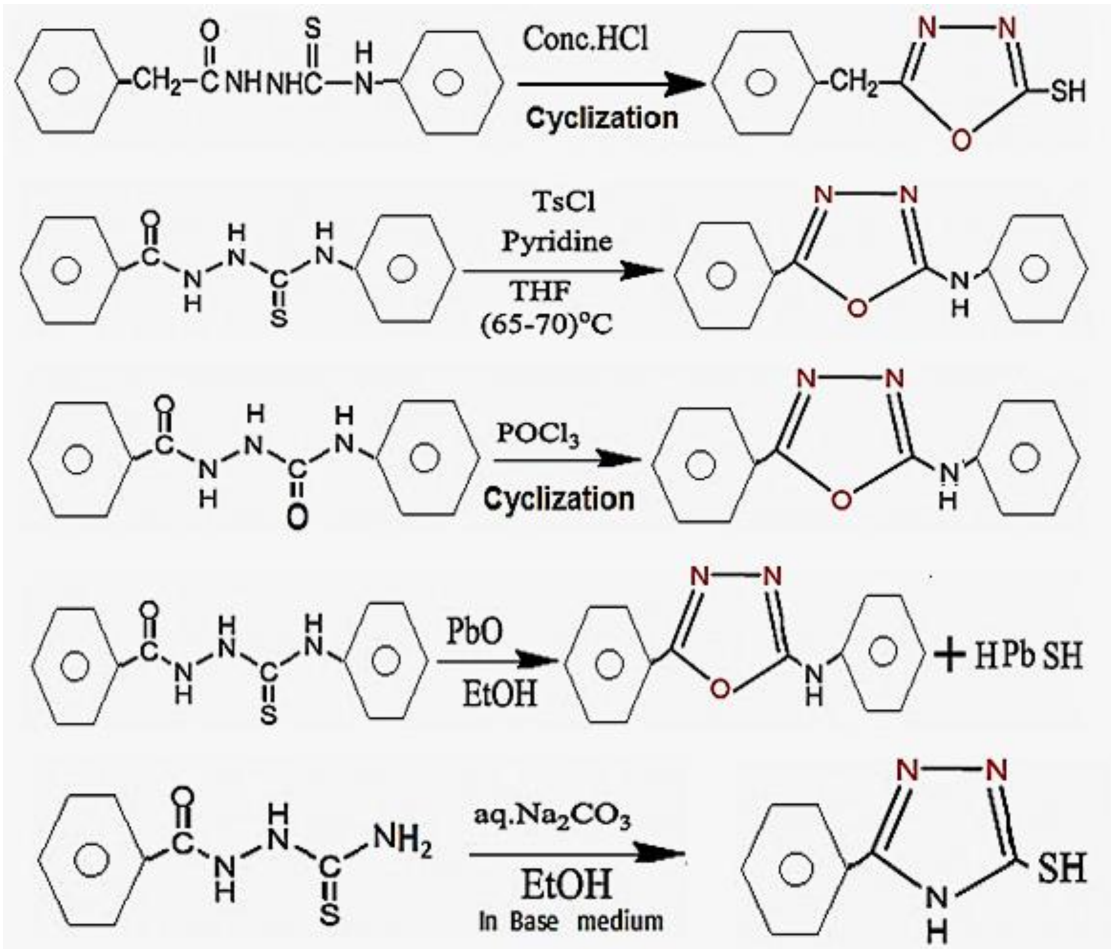
Other methods for cyclization process of hydrazine derivatives in presence of new catalysts:



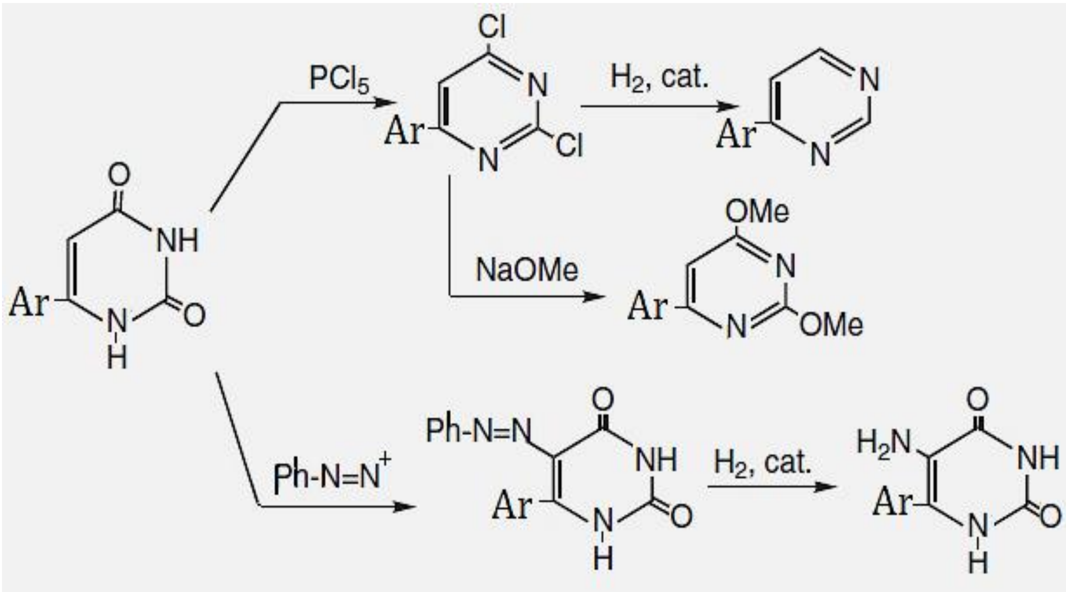
There is other catalyst represented by (CS_2) for ring closure of Hydrazine derivatives:



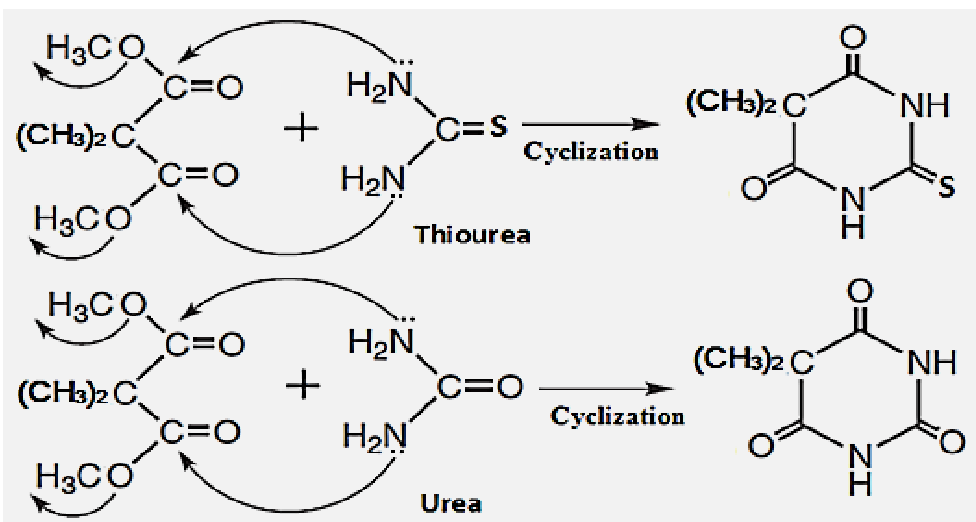
Also thiosemicarbazide and semicarbazide proceed to cyclization reaction by formation oxadiazole or thiadiazole or triazole ring via various catalyst :



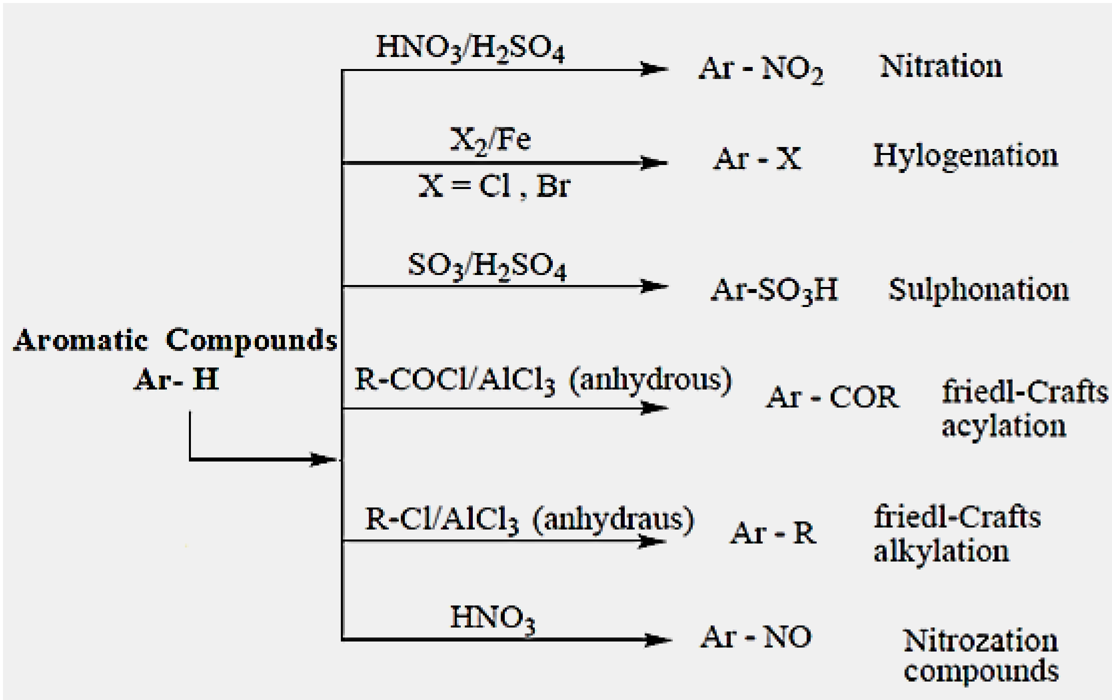
Also any product depends on type of functional group in any reactant not only catalysis or condition of reaction which affect directly on any products:



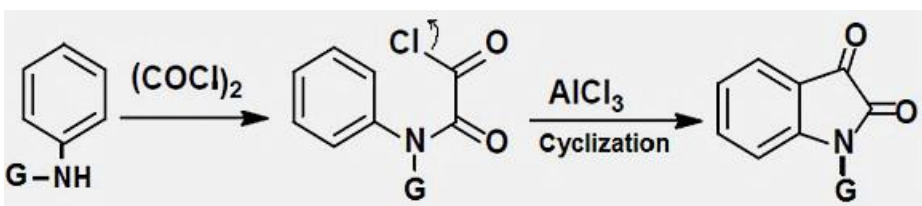
Reaction of any di-carbonyl compounds in cyclization reaction occurs in presence of acidic medium as a catalyst like (H_2SO_4 , HCl ,…)



In the other hand ,there are several catalysts for substitution reaction in aromatic compounds represented by (HNO_3, H_2SO_4, SO_3H ,$AlCl_3$, ……)



The reaction with any alkyl or acyl halide proceed toward alkylation process by Aluminum chloride :



III. CONCLUSIONS

The chemical reactions occur faster in the presence of a catalyst because the catalyst provides an alternative reaction pathway- or mechanism- with a lower activation energy than the non-catalyzed mechanism.

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