SYNTHESIS OF CHALCONE EPOXIDES

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DISSERTATION (CGO-500)

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Contents

INTRODUCTION

What is green chemistry?

Green chemistry is defined as invention,design,development and application of chemical products and processes to reduce or to eliminate the use and generation of substances hazardous to human health and environment.

‘Green Chemistry’ is the new branch of chemistry which involves pulling together tools, techniques and technologies. It is helpful to chemists and chemical engineers in research, and production for development of more eco-friendly and efficiently products which may have significant financial benefits. It will now be an essential tool in the field of synthetic chemistry. The development if green chemistry redefines he role os a solvent. “An ideal solvent facilitates the mass transfer but does not dissolve”. In addition, a desirable green solvent should be natural, nontoxic, cheap and readily available with additional benefits of aiding the reaction, separation or catalyst recycling. The term green chemistry was introduced first time by Anastas in 1991 in a special program created by the US Environmental Protection Agency (EPA) in order to stimulate a substantial development in chemistry and chemical technology.

Green chemistry can be comprehensively illustrated as a set of 12 principles, which were proposed by Anastas and Warner.

Over the last few years with development and technology chemical industries has been doing fantastically well and are providing many good novel things to the world. However, their betterment is accompanied by a plethora of negative environmental impacts-notably, production of unwanted and harmful toxic side products, low recycling rates and poor environmental degradation behavior, use of harmful reagents etc.

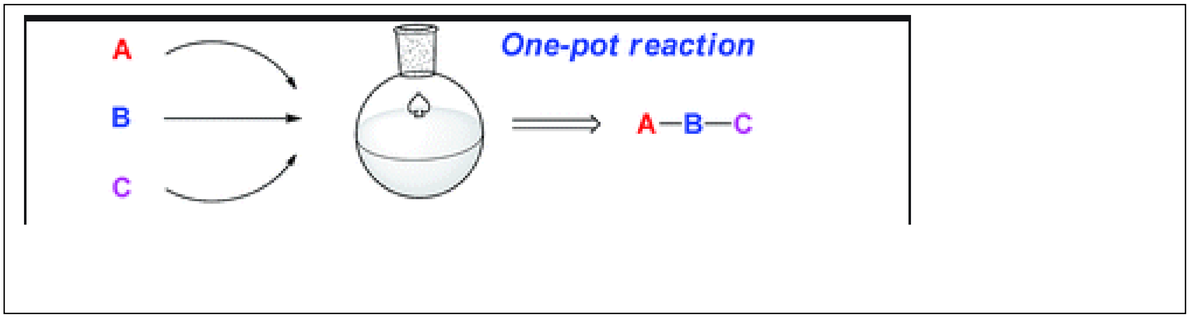
To overcome these problems environmentally friendly chemical approach has been of great importance. Green chemistry, also known as sustainable chemistry is the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products. This form of environmentally safe chemistry can be applied across the life cycle of different chemical products ranging from research, manufacturing, industry and design. Recent literature shows that green chemistry has significant potential for not only reducing byproducts waste pollutants and energy cost but also the potential for not only reducing by products waste pollutants and energy cost but also the potential to develop new methodologies towards previously unobtainable chemical products.

Green chemistry focuses on research that attempts to reduce or eliminate negative environmental impacts. Green chemistry aims to prevent waste and generate substances with little or no toxicity to humans and the environment, thereby maximizing atom economy. This is achieved by assuring that the final product contains the greatest possible proportion of the starting materials and avoiding the use of harmful solvents, or even better, any solvents at all. Chalcones represent an important class of natural compounds with a variety of biological activities.

Chalcones possess conjugated double bonds and a completely delocalized p-electron system on both the benzene rings. Chalcones are very common in natural products chemistry.Chalcones became an object of continued interest in both academia and industry.However, much of the pharmacological potential of chalcones is still not utilized. Chalcones are also well-known intermediates in the synthesis of various heterocyclic compounds.Several methods have been developed for the preparation of chalcone derivatives. The most common method is the base-catalyzed Claisen– Schmidt reaction. Chalcones can also be synthesized by combination of phase transfer catalyst and ultrasound irradiation, aldol-condensation,other renowned techniques include Suzuki reaction, Witting reaction, Friedel-Crafts acylation with cinnamoyl chloride, Photo-Fries rearrangement of phenyl cinnamates. Chalcones are open-chain precursors for biosynthesis of flavonoids and iso-flavonoids and occur mainly as poly-phenolic compounds whose colour changes from yellow to orange. They exist as either trans or cis.

The oxidation reaction, especially that of α, β-unsaturated ketones is an important method for the conversion of functional groups in organic synthesis. Efficient, mild and selective epoxidation of a,ß-unsaturated aldehydes and ketones was performed using polyvinylpyrrolidonesupported Oxone (Oxone/PVP) and ButOOH/PVP. Epoxidation reaction has recently been the subject of numerous investigations and a number of useful methodologies involving different types of catalyst-reagent combinations have been elaborated. Among these methodologies, the method utilizing phase-transfer catalysis occupies a unique place. The use of phase-transfer catalysis is a technique by which reactions between substances located in mutually immiscible phases are brought about or accelerated. Other epoxidation methods include Chlorohydrin process, Halcon reaction, Sharplessepoxidation, epoxidation with dioxirane, Epoxidation with atmospheric oxygen.

One pot synthesis is one of the green chemistry approaches; it is a simple, yet efficient method which allows compounds to be prepared without having to isolate and purify the intermediates, thereby reducing waste and increasing reaction efficiency. Reacting three or more components in a single operation can avoid the use of large amounts of solvents and expensive purification techniques. There are two forms of one pot synthesis in a one pot multicomponent process, reactants are added into reactor in a single step where as in one pot consecutive process reactants are added in different stages in different environmental conditions.

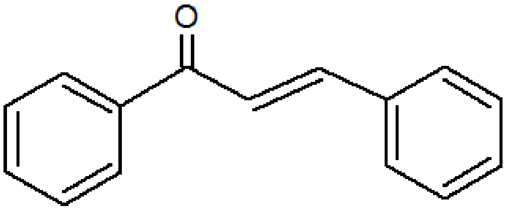


Epoxides are very important chemicals in organic synthetic chemistry and can serve as versatile precursor in synthesis of many natural products and drug molecules. Great attention has been dedicated on the development of methodologies allowing the epoxidation of carbon-carbon double bonds.

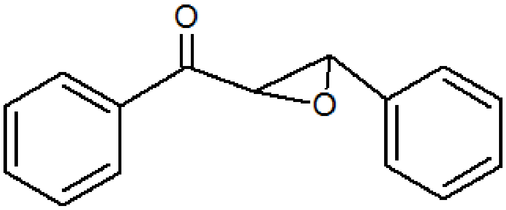
Epoxidation is one of the most important synthetic methods since it can easily add considerable value to simply substrate. Epoxidation has been widely studied using various reagents, catalysts and reaction conditions. Taking into account green chemistry principles aq. Hydrogen peroxide is one of the oxidant of choice because of its ease of handling, high oxygen content and formation of water as only byproduct.

Chalcones and chalcone epoxides are important classes of organic compounds with distant structural features and high synthetic utility. Chalcones, also known as α,β-unsaturated ketones, are abundant in edible, plants and are considered to be precursors of flavonoids and iso-flavonoids. Chalcones bear a very good synthon so that a variety of novel heterocycles with good pharmaceutical profiles can be designed.

Chalcone epoxides (α,β-unsaturated ketones) not only undergo the usual reactions of epoxides, but are also susceptible to several useful reactions owing to the presence of carbonyl groups.



Chalcone



Chalcone epoxide

Chalcones and chalcone epoxides display an enormous number of biological activities, including anti-cancer, anti-microbial, anti-inflammatory, anti-oxidant and anti-viral, additional, they are also used as constituents in perfumes formulations, and as intermediates in the production of flavoring substances.

PROPERTIES

Chalcons have two absorption maxima at 280nm and 340nm, chalcones are yellow in colour, chalconeepoxides are insoluble in water, chalcones can be fluorescent

ADVANTAGES AND DISADVANTAGES

Chalcones possess a simple chemistry, ease of hydrogen atom manipulation, straightforward synthesis, and a variety of promising biological activities. Chalcones have a wide bioactivity spectrum, chalcones and their derivatives are used as intermediates in organic synthesis, chalcones possess a wide range of biological applications , Epoxidation of alkenes helps in the production of perfumes and flavouring substances. Many of the chalcones are used as agro chemicals and also as drugs. The reactivity of chalcones may be affected both by the decoration of the aromatic rings.

LITERATURE REVIEW

Synthesis of chalcones

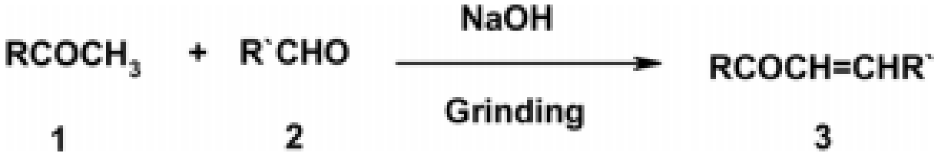
Several research papers were reviewed to synthesizechalcones. These include;

1. **Atom-Efficient, Solvent-Free, Green Synthesis of chalcones by Grinding**

Claisen- Schmidt Condensation

Several methods have been developed for the preparation of chalcone derivatives. The most common method is the base-catalyzed Claisen– Schmidt reaction, in which the condensation of a methyl ketone with an aldehyde is carried out in the presence of aqueous sodium hydroxide.Some other derivatives were prepared by condensation in chloroform in the presence of a catalytic amount of piperidine at 80C. Also, the Claisen–Schmidt reaction was improved by using KOH Al_2O_3 as a catalyst in alcoholic solvent under ultrasound irradiation. In addition, another method was described for the synthesis of chalcones using borontrifluoride-etharate as a catalyst at room temperature. However, in spite of their utility, some methods suffer disadvantages such as long reaction times (3–4 h) with high probability of side reactions (as Cannizaro or aldol condensation), small yields, chemical hazards, and environmental pollution.that many reactions can be conducted with good yields by just grinding solids (or liquid and solids) together. Because green approach has gained popularity in this paper we will study the green approach to study chalcones.

Several chalcones, were prepared (Equation 1) by grinding together equivalent amounts of the appropriate methyl ketones and different aldehydes in the presence of solid sodium hydroxide in a porcelain mortar under solvent-free conditions. Grinding for about 3–5 min led to a yellow-colored solid mass, which proved to be the target chalcone. Grinding continued for another 5–10 min. The crude products were easily separated by washing with cold water and simple Buchner filtration; final purification was achieved by crystallization from the appropriate solvents.



Equation 1 General reaction-synthesis of chalcones by claisenschmidt condensation

The method reported for the synthesis of chalcones is simple and effective in terms of short reaction time, excellent yields, and the formation of the product was measured by thin-layer chromatography (TLC).(Zohdi, 2009)

2. Synthesis of Chalcones by grindstone chemistry as an intermediate in Organic Synthesis

Facile synthesis of some novel chalcones (4-(Sub Phenyl)-1-phenyl 2-propen-1-ones) has been achieved by the condensation of Aromatic and aliphatic ketone with various substituted aromatic aldehydes through intramolecularaldol condensation using solid NaOH by using grinding technique. All synthesized compounds were characterized on the basis of IR, NMR and UV spectroscopic data and elemental analysis.

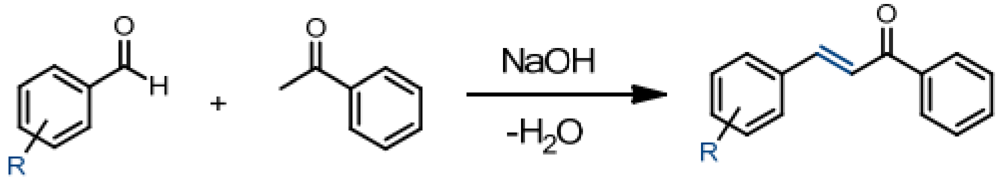
Different aldehydes (0.05 mmol), substituted acetophenone (0.05 mmol) and 2.0 g solid NaOH was taken in a small mortar. The mixture was thoroughly grinded for 5-10mins. The mixture turned solid, yellow in color and then it was kept overnight. Then washed with cold water andwas filtered toobtain the crude product. The product was recrystallised using the solvent as an ethanol, the product was then dried and weighed.

The notable advantages of present method are no organic solvent required (except for the product recrystallisation), waste minimization, simple operation, clean reaction profile, easy work-up, shorter reaction time (4-8 min), high yields (75-85%) and eco-friendly as compared to conventional method.(Piste, 2014)

3. Solvent-Free Aldol Condensation Reactions

At the beginning of the experiment, an “unknown” benzaldehyde derivative (4-chlorobenzaldehyde, 4-bromobenzaldehyde, or 3-bromobenzaldehyde) was taken to use in the solvent-free aldol condensation. The procedure involved grinding acetophenone with one equivalent of sodium hydroxide and benzaldehyde derivative for ten minutes using a mortar and pestle. Each chalcone was then isolated by suction filtration after washing with water.

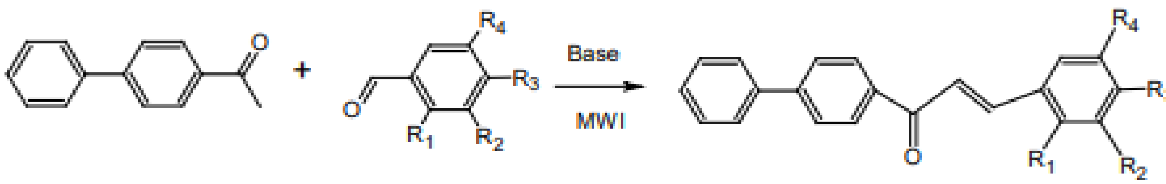
Although the crude chalcone is often found to have sufficient purity for product characterization, recrystallization is performed with 95% ethanol to remove trace impurities. In order to determine the identity of their chalcone TLC, NMR, IR was performed.(The Royal Society of Chemistry , 2017)



Equation 2 Synthesis of chalcones

4. Microwave Irradiation Synthesis of Various Substituted Chalcones Using Various Heterogeneous Catalysts under Solvent - Free Conditions and their Biological Studies

They are commonly synthesized via the Claisen-Schmidt condensation between acetophenone and benzaldehyde. This reaction is catalyzed by acids and bases under homogeneous conditions. This homogenous reaction gives low yield, takes longer reaction time and presents several hurdles, such as catalysts recovery and waste disposal problems. In this respect, heterogeneous catalysts are considered as an eco-friendly alternative. The utilization of heterogeneous catalysts for the production of chalcones was reported in the literature9-12. Utilization of greener process i.e. non-conventional energy source like microwave13 has become a very popular and useful technique in synthetic organic chemistry and has gained wide popularity due to many practical advantages associated with enhanced reaction rates, high yields, improved selectivity and environment friendly reaction conditions. Now a facile nonconventional heterogeneous approach for the synthesis of substituted chalcones with a wide range of groups of varying lipophilicities and electronic character from substituted acetophenones and benzaldehydes using basic solid supports (Mont-K10, anhydrous K_2CO_3, anhydrous $ZnCl_2$ and fused $Ba(OH)_2$) under microwave activation has been reported.



Equation 3 Synthesis of substituted chalcones

Method A- Conventional

To a solution of biphenyl acetophenone (0.01mol) and substituted aromatic aldehyde(0.01 mol) dissolved in ethanol / methanol (10 mL) was added basic inorganic catalysts (40-400 mg).The heterogeneous mixture was stirred at room temperature for 24-36 h. After the completion of the reaction as monitored by TLC, the reaction mixture was treated with ice-cold water / dilute acid to get the precipitate of the product leaving behind Mont-K10/ fused $Ba(OH)_2$ dissolved in solution. The product was filtered, washed with water and recrystallized with ethanol or ethanol-benzene mixture (1:1; v/v) to afford analytical samples of chalcones.

Method B: - Solid phase microwave irradiation (MWI)

To a solution of biphenyl acetophenone(0.01 mol) and substituted aromatic aldehyde (0.01mol) in ethanol (5 mL) taken in a borosil flask (100 mL), inorganic catalysts (5-7 g) was added. The reaction mixture was mixed and the adsorbed material was dried, in air and irradiated inside the microwave oven and irradiated intermittently for a period. Progress of the reaction was monitored by TLC. After the completion of the reaction, the product was cooled, purified and recrystallized. (SHOREY SHWETA, 2012)

5. A Green chemical method for the synthesis of chalcones using Amberlite Resin.

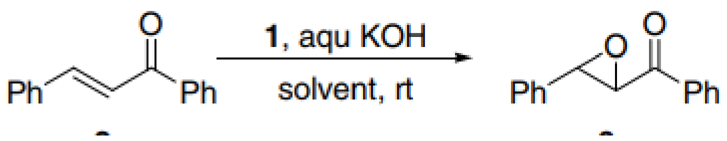
Solution phase conventional method: A mixture of acetophenone (1 equivalent) and substituted aryl aldehyde (1 eq) was stirred in ethanol (10 vol) and then hydroxide ion resin (W/W) was added. The mixture was stirred at room temperature. On completion of reaction (monitored by TLC at an interval of every 15 minutes), it was poured in to crushed ice and acidified with HCl. The solid separated was filtered and recrystallized from ethanol.

b. Solid phase synthesis: To a mixture of acetophenone (1 eq) and substituted aromatic aldehyde (1eq) taken in 50mL borosil flask, hydroxide ion resin (W/W) was added and the mixture was stirred at room temperature. The reaction was monitored by TLC at an interval of 15 minutes and after the completion of reaction, product was obtained through extraction in organic solvents. The product was recovered after distilling off the solvent under reduced pressure and purified by recrystallization. (R.M.Ezhilarasi, 2015)

Equation 4 Synthesis of chalcones using ion exchange resin

6. Facile epoxidation of a,b-unsaturated ketones with cyclohexylidenebishydroperoxide

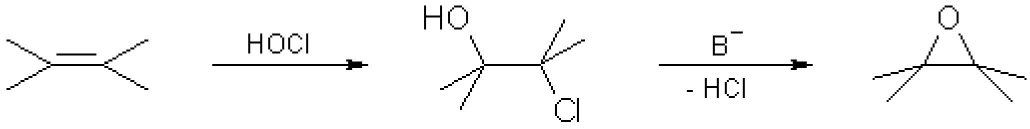
The epoxidation of trans-chalcone usingcyclohexylidenebishydroperoxide**(Jakka, 2006)**



Equation 5Theepoxidation of trans-chalcone

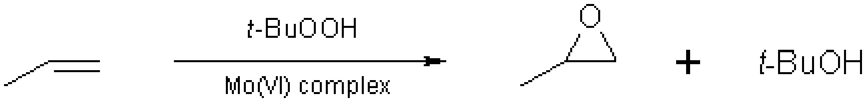
7. Other epoxidation Methods

- Chlorohydrin process (indirect epoxidation): Reaction of the olefin either with hypochlorous acid or with chlorine and water gives the chlorohydrin which subsequently yields the epoxide on alkaline treatment.



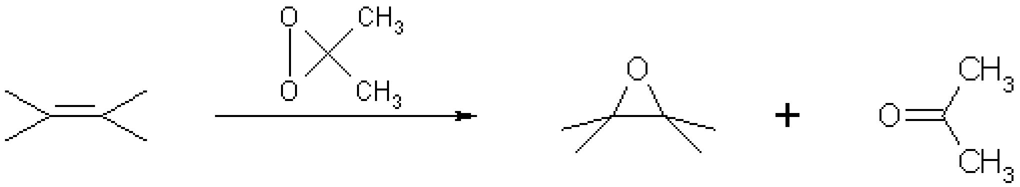
Equation 6 Chlorohydrin process

- Halcon reaction: Epoxides also can be prepared by treating olefins with alkyl hydroperoxides, mainly *tert*-butyl hydroperoxide, catalyzed by vanadium, titanium or molybdenum complexes.



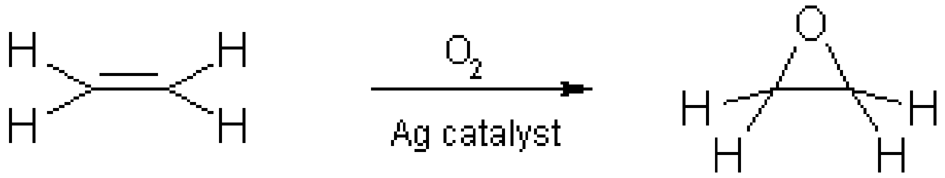
Equation 7Halcon reaction

- Sharplessepoxidation: Reaction of the olefin with one of the enantiomers of diethyl tartrate stereoselectively yields the epoxide.
- Epoxidation with dioxirane



Equation 8Epoxidation with dioxirane

- Epoxidation with atmospheric oxygen



Equation 9Epoxidation with atmospheric oxygen

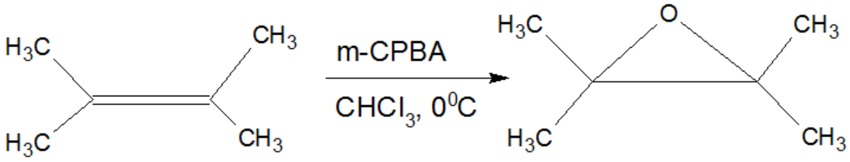
Due to increase in biological importance and well known properties of epoxide and its derivatives, there are lots of studies being carried out for the synthesis of epoxides. Over the years synthetic routes have been developed, some of the routes have been listed below.

Direct reaction of oxygen

$$7\ H_2C{=}CH_2 + 6\ O_2 \longrightarrow 6\ C_2H_4O + 2\ CO_2 + 2\ H_2O$$

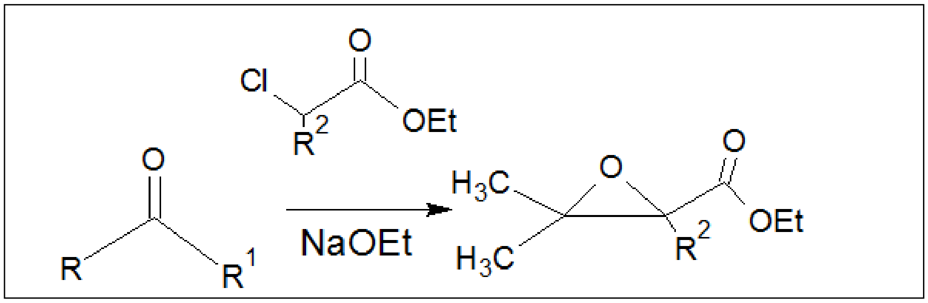
The direct reaction of oxygen with alkenes is useful only for this epoxide. Modified silver catalysts are typically employed other alkenes fail to react usefully.

Using peroxy acids



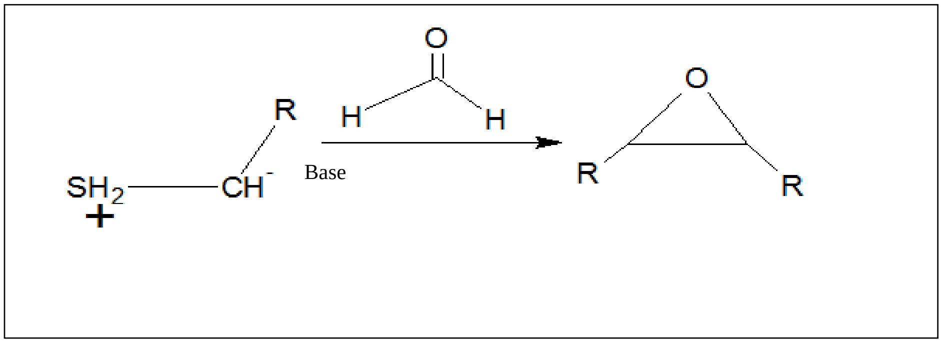
This approach involves the oxidation of the alkene with peroxy acid, such as m-CPBA, the reaction proceeds via what is commonly known as the “Butterfly Mechanism”. The peroxide is viewed as an electrophile, and the alkene a nucleophile. The reaction is considered to be concerted. The butterfly mechanism allows ideal positioning of the O-O sigma star orbital for C-C Pi electrons to attack because two bonds are broken and formed to the epoxide oxygen, this is formally an example of a coarctate transition state.

Darzenglycidic ester condensation

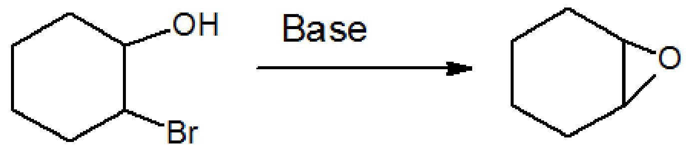


The reaction process begins when a strong base is used to form a carbanion at the halogenated position because of the ester, this carbanion is resonance stabilized enolate, which makes it relatively easy to form. This nucleophilic structure attacks another carbonyl component, forming a new carbon-carbon bond. These first two steps are similar to a base-catalysedaldol reaction. The oxygen anion in this aldol-like product then does an intramolecular SN2 attack on the formerly nucleophilic halide bearing position, displacing the halide to form an epoxide. This reaction sequence is thus a condensation reaction since these is a net loss of HCl when the two reactant molecules join.

Johnson Corey Chayvoski Reaction



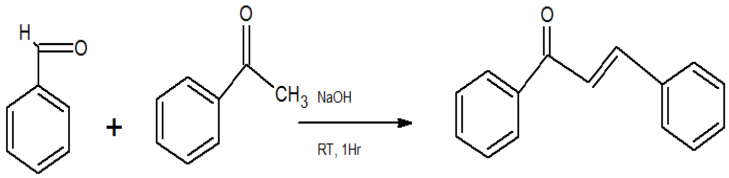
Using Halohydrins



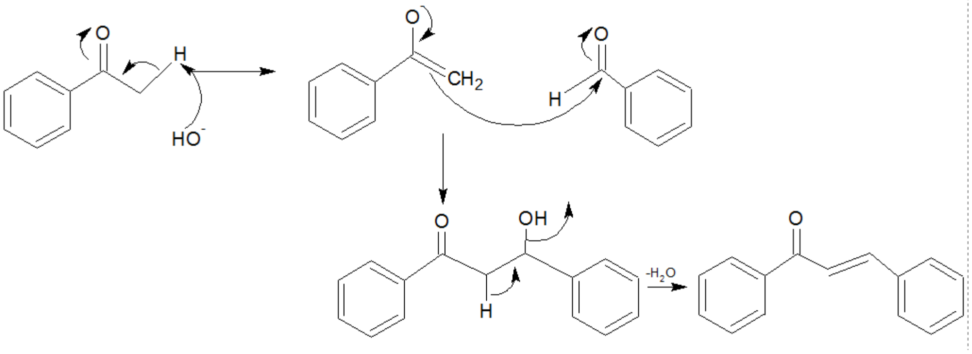
PRESENT WORK

Synthesis of chalcone

Procedure I. Chalconeswere prepared using ClaisenSchmidth condensation reaction using acetophenone and benzaldehyde and its derivatives in the NaOH and ethanol as solvent under stirring at room temperature for 1 hr.



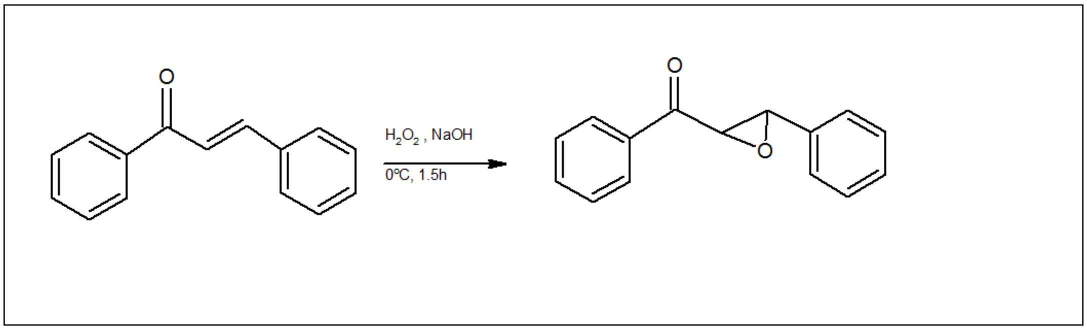
Mechanism:



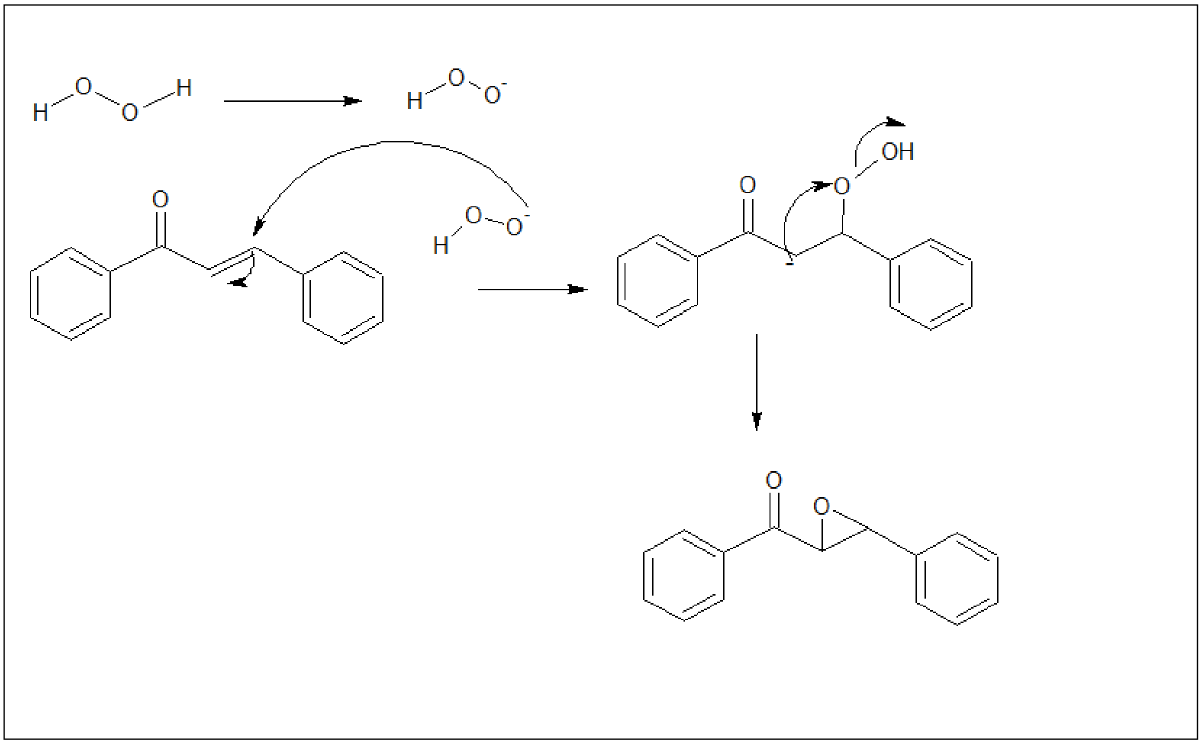
Procedure II. Green method:A mixture of the appropriate methyl ketones, aromatic aldehyde and sodium hydroxide was thoroughly ground with a pestle in an open mortar at room temperature for 2-3 minutes until the mixture turned into a melt. The initial syrup reaction mixture solidified within 3-5 min. grinding continued for 5-10 min more, and the reaction was monitored by TLC. The solid was washed with cold water to remove sodium hydroxide and recrystallized from the appropriate solvent to give the corresponding chalcone derivatives.

Synthesis of chalcone epoxide

Procedure I. Epoxides were placed by treating chalcone and its derivatives with hydrogen peroxide and NaOH using ethanol as solvent and stirring at 0^{o} C for 1.5 hr.



Mechanism:



Experimental work

By green synthesis

A mixture of the appropriate methyl ketones (5mmol), aromatic aldehyde (5mmol) and sodium hydroxide (7mmol) was thoroughly ground with a pestle in an open mortar at room temperature for 2-3 minutes until the mixture turned into a melt. The initial syrup reaction mixture solidified within 3-5 min. grinding continued for 5-10 min more, and the reaction was monitored by TLC. The solid was washed with cold water to remove sodium hydroxide and recrystallized from the appropriate solvent to give the corresponding chalcone derivatives.

By conventional method

Take benzaldehyde (5mmol), acetophenone (5mmol), and into a 50 mL round-bottomed flask along with a magnetic stir bar. The solution should be cooled to room temperature before proceeding to the next step. While stirring at room temperature, add 1.0 mL of 30%aqueos NaOH sol to the reaction mixture over a period of 3-5 minutes. Then stir the reaction for another 60 min at room temperature. Observe the formation of solid chalcone product. Filter this solid under the vacuum and give the washing with water.

Take above dried solid product and add 10 mL of ethanol to it. Sometimes, it may be necessary to warm the mixture in a hot-water bath to dissolve the solid. Do not overheat. Bring the reaction mixture to room temperature. Add 1.0 mL of 30% hydrogen peroxide to the reaction mixture. Stir the mixture in an ice bath for 1.5 hr keeping the ice bath temperature between $0^{o}C$ and $2^{o}C$. After the reaction time, remove the stir bar and ass 10 mL of ice water to the reaction mixture. Cool the mixture in an ice-water bath for 5-10 min. also, cool 10 mL of distilled water in the ice bath. Collect your product by vacuum filtration. Wash the product in the funnel with cold distilled water. Let the product dry at the vacuum and transfer it to a pre-weighed vial.

By one pot synthesis

Take benzaldehyde (5mmol), acetophenone (5mmol), and methanol (10.0 mL) into a 50 mL round-bottomed flask along with a magnetic stir bar. The solution should be cooled to room temperature before proceeding to the next step. While stirring at room temperature, add 1.0 mL of 30% aqueous NaOH solution to the reaction mixture over a period of 3-5 min. Then stir the reaction for another 30 min at room temperature. Observe the formation of solid chalcone product. Gently heat the reaction mixture in a hot water bath for few minutes to dissolve the chalcone. Bring the reaction mixture to room temperature. Add 1.0 mL of 30% hydrogen peroxide to the reaction mixture. Stir the mixture in an ice bath for 1.5 hr keeping the ice bath temperature between 0^oC and 2^oC. After the reaction time, remove the stir bar and add10 mL of ice water to the reaction mixture. Cool the mixture in an ice-water bath for 5-10 min. Also,cool 10 mL of distilled water in the ice bath. Collect your product by vacuum filtration. Wash the product in the funnel with cold distilled water. Let the product dry at the vacuum and transfer it to a pre-weighed vial.

Derivatives of chalcone epoxides were prepared using acetophenone and substituted benzaldehyde by above mentioned methods. If substituted benzaldehyde is a solid, stir the mixtureto dissolve any solids present. Sometimes, it may be necessary to warm the mixture in a hot-water bath to dissolve the solid.

Epoxidation of chalcone with urea-hydrogen peroxide under ultrasound irradiation.

Preparation of Urea Hydrogen Peroxide

6.6g of urea was taken in a 250 mL beaker to that 10.344 mL of hydrogen peroxide was added the mixture was stirred and heated at about 75^0C-80^0C. The mixture was then kept in the freezer at about 0^0C. the mixture was filtered and the filtrate was chilled.

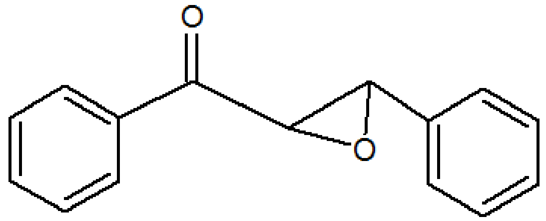
Epoxidation

In a 50 mL pyrex flask containing corresponding chalcone to that 0.300g of Urea Hydrogen Peroxide was added. To the mixture 20mL ethanol, 8mL water and 0.40mL 30%NaOH was added. The mixture was then irradiated to an ulsonic bath for 15 min. the mixture was extracted using diethyl ether then it was washed with water and dried over anhydrous sulphate. The solvent was then evaporated with reduced pressure. The residue was then crystallised with ethanol to give the corresponding epoxide.

Results and Discussion

The following compounds were synthesized and analyzed by IR spectroscopy.

1.



IUPAC name: Phenyl(3-phenyloxiran-2-yl)methanone

Yield: One pot synthesis- 0.5g

Urea hydrogen peroxide-0.2472g

Nature- crystalline

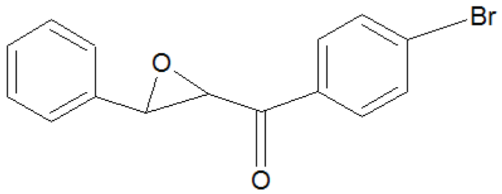
Colour-white

IR spectra details-$\upsilon_{Ar\text{-}H}$ = 821cm^{-1}

$\upsilon_{C=O}$ of ketone = 1745-1715 cm^{-1}

$\upsilon_{C=C}$ of aromatic = 1600-1400 cm^{-1}

2.



IUPAC name: (4-bromophenyl)(3-phenyloxiran-2-yl)methanone

Yield: One pot synthesis-2.0291g

Urea hydrogen peroxide-0.3231g

Nature- Amorphous

Colour- Yellowish

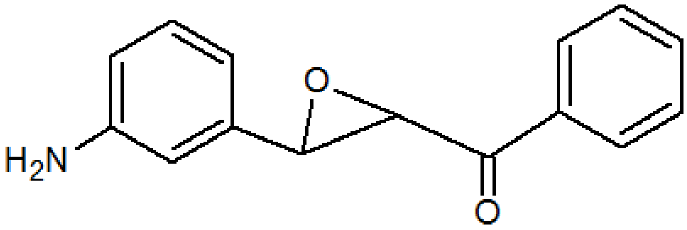
IR spectra details-$\upsilon_{Ar\text{-}H}$ = 821cm^{-1}

$\upsilon_{C=O}$ of ketone = 1745-1715 cm^{-1}

$\upsilon_{C=C}$ of aromatic = 1600-1400 cm^{-1}

$\upsilon_{C\text{-}Br}$ =690-515 cm^{-1}

3.



IUPAC name: [3-(3-aminophenyl)oxiran-2-yl](phenyl)methanone
Yield: One pot synthesis-1.0g

Urea hydrogen peroxide-0.3078g

Nature- Crystalline

Colour- Orange

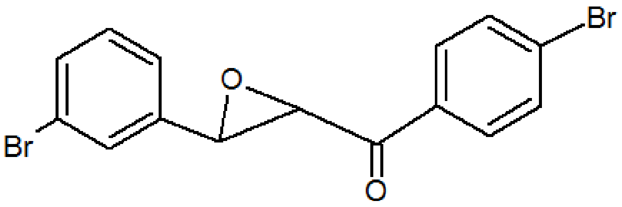
IR spectra details-$\upsilon_{Ar\text{-}H}$ = 821cm^{-1}

$\upsilon_{C=O}$ of ketone = 1745-1715 cm^{-1}

$\upsilon_{C=C}$ of aromatic = 1600-1400 cm^{-1}

$\upsilon_{C\text{-}NH2}$ = 3400-3300 cm^{-1}

4.



IUPAC name: (4-bromophenyl)[3-(3-bromophenyl)oxiran-2-yl]methanone

Yield: One pot synthesis- 2.2951g

Urea hydrogen peroxide- 0.4058g

Nature- crystalline

Colour- yellowish

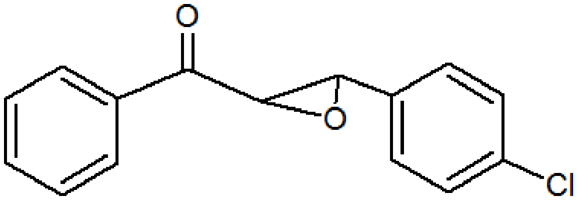
IR spectra details-υ_{Ar-H} = 821cm^{-1}

$\upsilon_{C=O}$ of ketone = 1745-1715 cm^{-1}

$\upsilon_{C=C}$ of aromatic = 1600-1400 cm^{-1}

υ_{C-Br} =690-515 cm^{-1}

5.



IUPAC name: [3-(4-chlorophenyl)oxiran-2-yl](phenyl)methanone

Yield: One pot synthesis- 84%

Urea hydrogen peroxide- 70%

Nature- crystalline

Colour- pale yellow

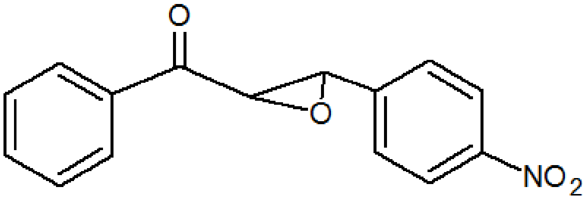
IR spectra details- $\upsilon_{Ar\text{-}H}$ = 821cm^{-1}

$\upsilon_{C=O}$ of ketone = 1745-1715 cm^{-1}

$\upsilon_{C=Cl}$ = 800-600 cm^{-1}

$\upsilon_{C=C}$ of aromatic = 1600-1400 cm^{-1}

6.



IUPAC name: [3-(4-nitrophenyl)oxiran-2-yl](phenyl)methanone

Yield: One pot synthesis- 84%

Urea hydrogen peroxide- 70%

Nature- crystalline

Colour- pale yellow

IR spectra details- $\upsilon_{Ar\text{-}H}$ = 821cm^{-1}

$\upsilon_{C=O}$ of ketone = 1745-1715 cm^{-1}

υ_{NO2} stretch = 1600-1500 cm^{-1} and 1400-1300 cm^{-1}

$\upsilon_{C=C}$ of aromatic = 1600-1400 cm^{-1}

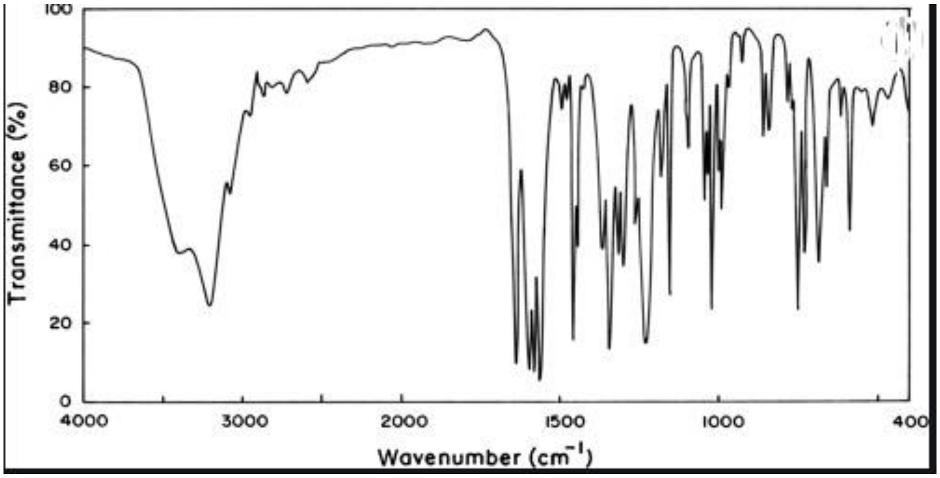
Conclusion

We have successfully synthesized and isolated chalcone epoxides and its derivatives. It was seen that the use of substituted benzaldehyde with the electron withdrawing group higher yield was observed compared to the benzaldehyde with electron donating group which gives lesser yield. The compounds were characterized by IR Spectroscopy. These derivatives could be further subjected for evaluation for the identification of their activities.

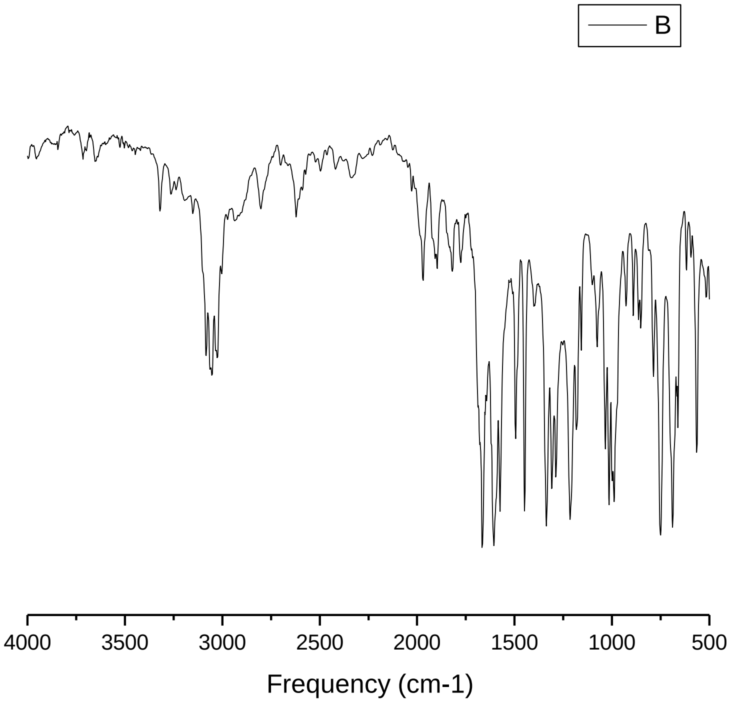
Spectral attachments

Synthesis of chalcones

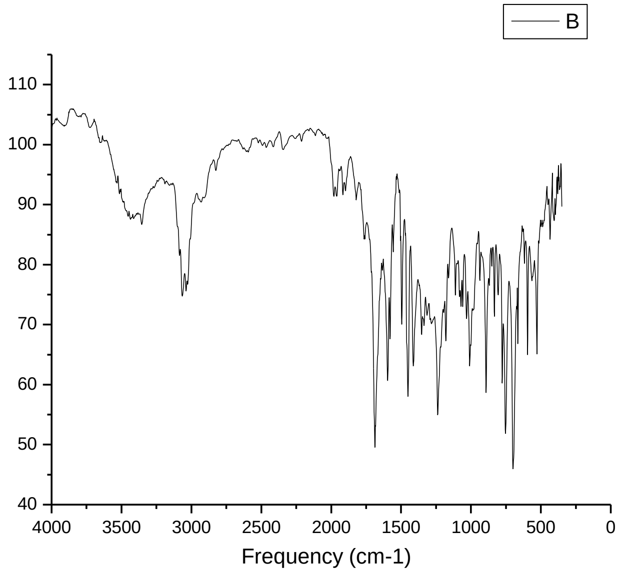
1. Chalcone 1



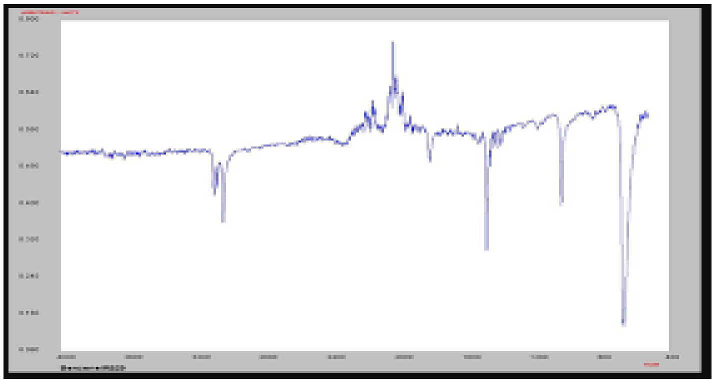
Chalcone epoxide by UHP



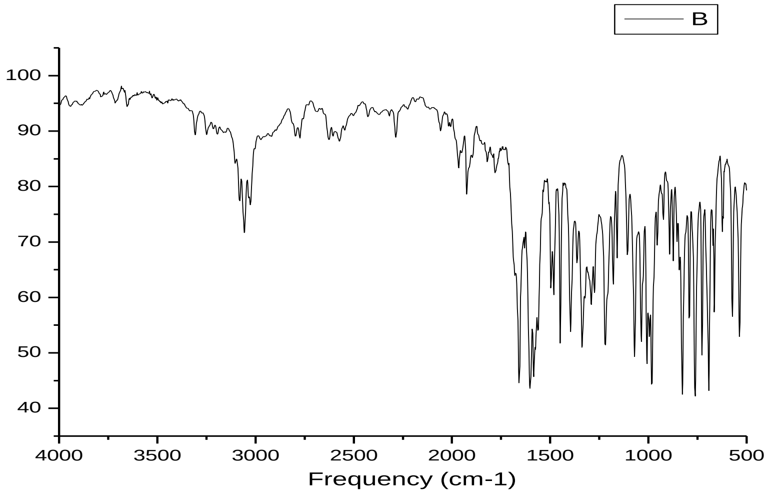
Chalcone epoxide by OPS



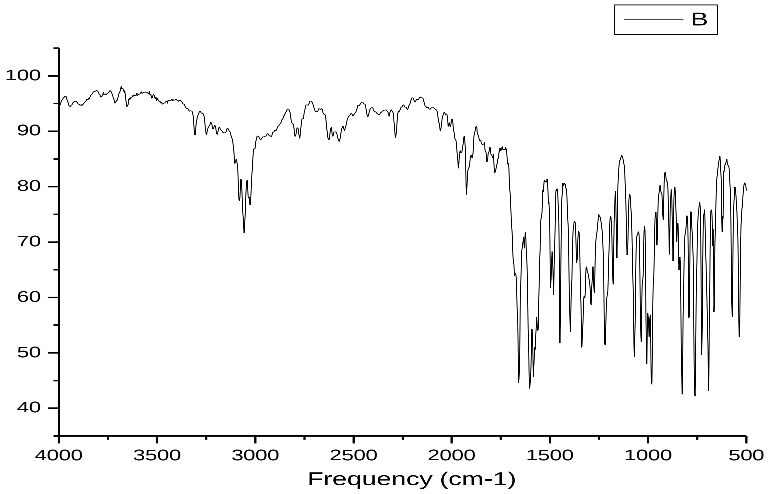
2. Chalcone 2



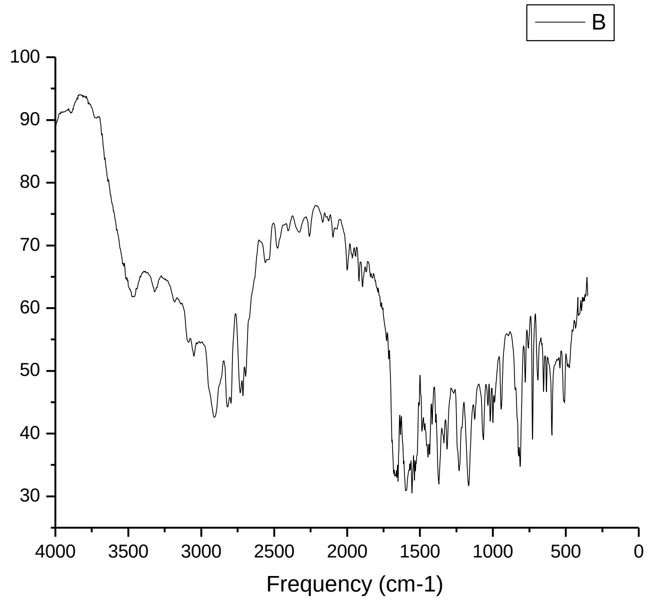
Chalcone by UHP



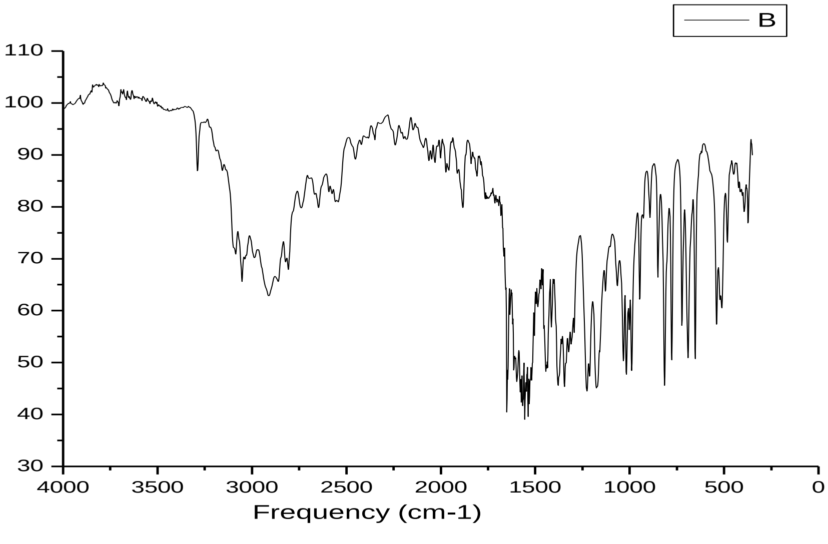
Chalcone by OPS



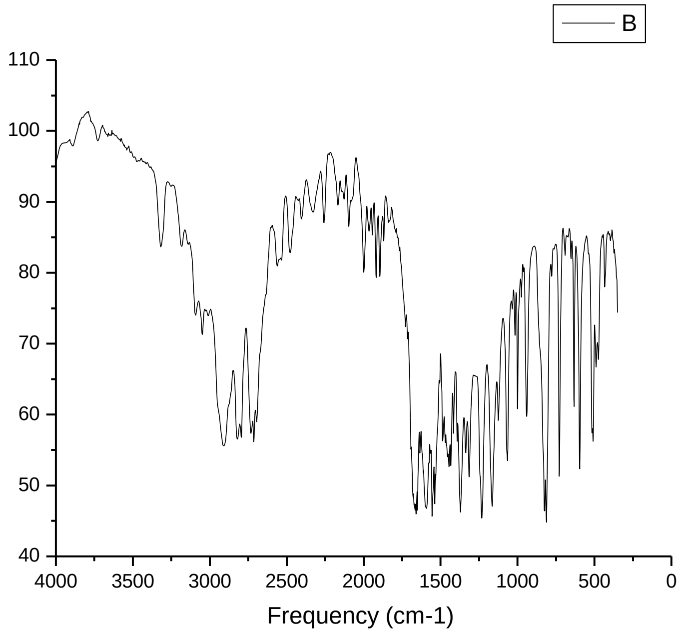
3. Chalcone 3



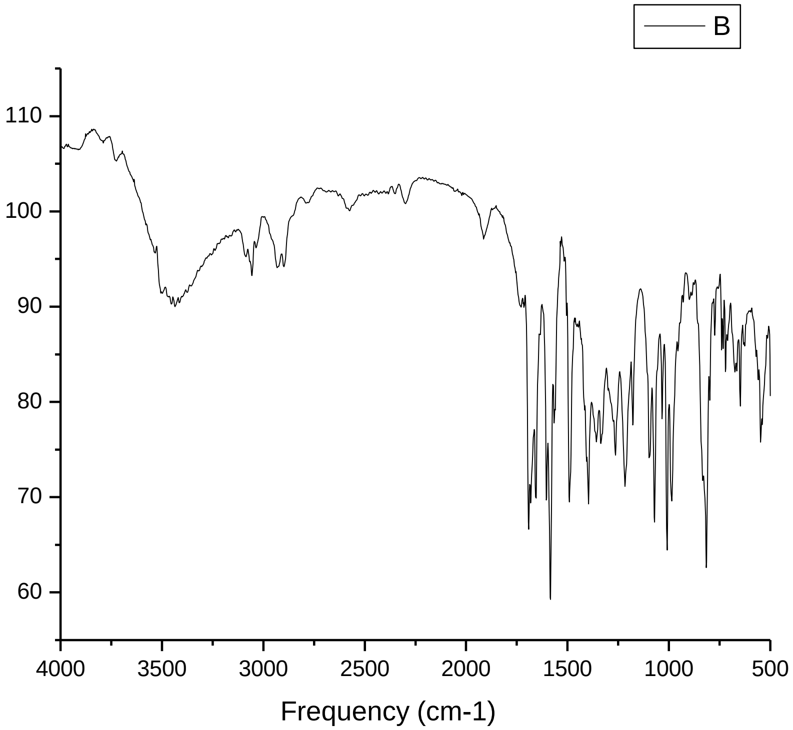
Chalcone by UHP



Chalcone by OPS



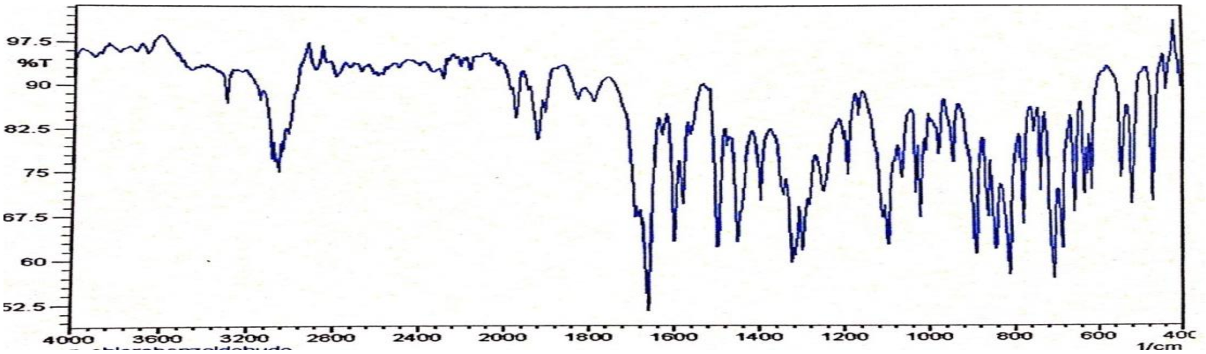
4. Chalcone 4



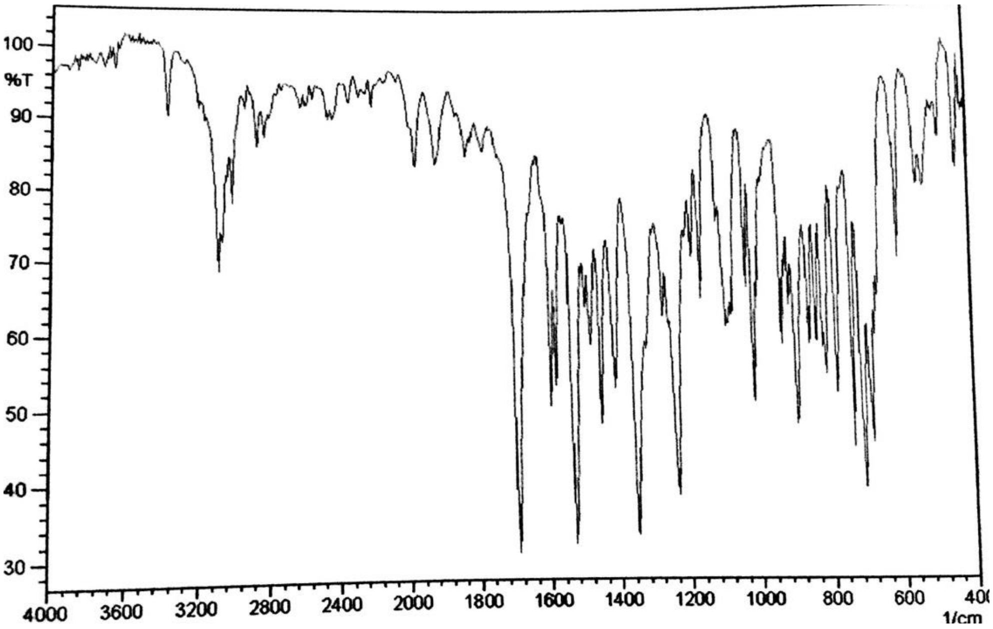
Chalcone by UHP

Chalcone by OPS

5. Chalcone epoxide 5



6. Chalcone epoxide 6



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