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Beta-benzoyl propionic acid synthesized with the aid of nanozeolite spur and ultrasonication in a variety of ways

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Abstract:

According to a recent study, zeolite is used in amazing ways for the synthesis of organic compounds. Green method for producing 1-phenyl naphthalene and its derivatives from a small amount of benzoyl propionic acid (BPA). A green reagent like nanozeolite is used in the friedel craft reaction after the preparation of the precursor -BPA. In place of anhydrous aluminium chloride, it is crystalline sodium aluminium silicate hydrate hydrochloride after treatment with -TEA. The traditional approach involves condensing benzene and succinicanhydride with activated Nanozeolite, working up the reaction to get the desired product, and then recycling the catalyst. BPA was produced by an ultrasonic process. It was reduced to two steps: first, acylation utilising active nanozeolite and ultrasonication; second, hydrolysis; and third, catalyst recycling. When compared to conventional synthesis, it has been found that using a sonicator produces a higher yield while using less energy.

Keywords: *Nanozeolite, β benzoyl propionic acid (β-BPA), friedel craft reaction, Ultrasonication*

1. Introduction

The green method of producing 1-phenyl naphthalene uses beta-benzoyl propionic acid as a crucial precursor. Following the Friedel-Craft reaction, the -Benzoyl propionic acid has been produced in a variety of ways, including the conventional methods of benzene, succinic anhydride, and AlCl3. It has been replaced by environmentally friendly processes like ultrasonication utilising nanozeolite zeolite catalyst or traditional ultrasonication using AlCl3.

Haworth and colleagues synthesised the system in a number of steps beginning with Benzoyl propionic aid in one of the several ways used to synthesise the 1-phenyl naphthalene type of lignin. The Friedel-Crafts reaction was created by Charles Friedel and James Crafts in 1877 to attach substituents to an aromatic ring [1]. Alkylation and acylation Friedel-Crafts reactions progress via electrophilic aromatic substitution reactions [2]. Because alkylation can result in polyalkylated compounds, FC acylation is a prized atom economy option. The acylated- producing molecule is easily converted to the resulting alkanes by Clemmensen or Wolff- Kishner reduction. It involves the use of a potent lewis acid catalyst in the acylation of

aromatic ings with succinic anhydride. Additionally, cyclic anhydrides and acid chlorides make it likely [3-5].

Since it is a crucial intermediary in the synthesis of cyclo lignans and has important physiological features, 1-phenyl naphthalene's synthesis has attracted a lot of attention 1. Taiwanin-C was created by Haworth et al. 2 while Justicidin B and Justicidin E were produced by Block Stevenson3 using the 1-phenyl naphthalene system. Beta-Benzoyl propionic acid, which has two reactive methylene groups and a carboxylic functional group and could lead to the fundamental structure of lignan, was used to prepare pericarbonyl lactone. The oxo group might be decreased, and the carboxyl group would produce a portion of the furan ring.

Experimental methods (synthesized with the aid of nanozeolite spur).

2. Classical Approaches:

β-benzoyl propionic acidhas prepared from succinic anhydride, benzene and activated nanozeolite. Ina 2 L three–necked round bottom flask fitted with a mechanical stirrer and two reflux condensers are placed 68 g (0.68 M) of succinic anhydride and 350 g (4.5 M) dry, thiophene free benzene. With continuous stirring is started and 200 g (1.5 M) of powdered, anhydrous aluminum chloride (It acts as highly reactive hydrogen abstracter) is added all at once. Hydrogen chloride fumes are evolved and the mixture becomes hot. the flask is then surrounding by cold water and 300 cc of water is slowly added from a dropping funnel inserted in the top of condensers the excess of benzene is discarded and obtained mass separates as a colorless oil which soon solidifies after cooling to 00C, it is collected, washed with a cold mixture of 50 cc of concentrated hydrochloric acid and 150 cc of water. The crude β-BPA is dissolved in a solution of 75gm of anhydrous sodium carbonate in 25cc of water by boiling for fifteen minutes. The clear colourless filtered is transferred to 500 cc of beaker and carefully acidified with 6.5 cc of concentrated hydrochloric acid in freeze condition to maintain temperature 0-50C by ice-salt bath. The solution is filtered by suction pump, washed with hot water, dry give β –benzoyl propionic acid.

2.1 Ultrasonication Methods:

Finally those compounds are characterized by IR, NMR and mass spectra, key precursors of 1-phenyl naphthalene and therapeutic medicinal drugs. In present research work one pot synthesis of β-BPA and their derivatives via Friedel Craft acylation reaction. The anhydrous aluminum chloride catalyst use in Friedel–Craft acylation reactions for above said compounds are often using in Ultrasonication methods.

Table 1.1. Synthesis of Beta Benzoyl propionic acid by Catalysts anhydrous AlCl3 and Nanozeolite

S. N.	**P**	**Molecular Formula**	**Time(Min)**				**Yield (%)**			
			Anhydrous $AlCl_3$		**Nanozeolite zeolite**		**Anhydrous $AlCl_3$**		**Nanozeolite zeolite**	
			CV	US	CV	US	CV	US	CV	US
1	2a	$C_{10}H_{10}O_3$	46	5.2	32	3.21	78	89	87	98
2	2b	$C_{11}H_{12}O_3$	34	3.4	25	2.34	86	92	92	97
3	2c	$C_{14}H_{12}O_3$	124	2.05	10	0.27	84	90	94	92

CV= Conventional method, **US**= Ultrasonication method

3. Result and discussion:

Methods of preparation for initially acylation by using Ultrasonication irradiation and in second hydrolysis are contemporary innovations in recycling catalyst. After being treated with -TEA in place of anhydrous aluminium chloride, nanozeolite is crystalline and contains sodium aluminium silicate hydrate hydrochloride. In the traditional process, activated Nanozeolite is used to condense benzene and succinic anhydride, which is then worked up to produce the required product before the catalyst is recycled. The process of producing -BPA that was caused by ultrasonication was reduced to two steps: first, acylation utilising active nanozeolite and ultrasonication; and second, hydrolysis and catalyst recycling. The BPA are optimised by catalyst, time, temperature, and yield.

4. Conclusion:

The current work demonstrates that ultrasonic irradiation successfully replaces the friedel craft reaction, which produces benzoyl propionic acid by heating aluminium chloride. In a study comparing the green method (ultrasonication irradiation) to the conventional (thermal heating) method for the friedel reaction, the green method performed better in terms of reaction time, reaction temperature, and product yield. So it is a new instrument for the Ultrasonication-Induced Organic Synthesis (MIOS) of benzoyl propionic acid and its derivatives. According to the aforementioned study, nanozeolite serves as both a Lewis acid and an Arrhenius acid while producing -benzoyl propionic

acid. Anhydrous AlCl3 is replaced with nanozeolite as a catalyst in the Friedel Craft acylation procedure, which effectively decreases the yield.

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Competing interest

Authors have no competing financial interests.

Inclusion and diversity

We support inclusive, diverse, and equitable conduct of research.

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