

Green Synthesis of Organic Derivatives

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ABSTRACT

Recent advances in catalysis have been led by the development of new synthetic methods that provide control over size, reaction condition etc. The utilization of high intensity ultrasound offers a facile, versatile synthetic tool for synthesis that are often unavailable by conventional methods. The primary physical phenomena associated with ultrasound that are relevant to materials synthesis are cavitation and nebulization. In this type phase catalysed by auto micro reactors for sonochemistry. It is a hot gas inside bubbles isolated from one another in a liquid and hot droplets isolated from one another in a gas. Some synthetic reaction carried out by sonication with time and energy saving.

Keywords : Cavitation, Nebulization, Ultrasound

I. INTRODUCTION

Chemistry deals with the interaction between energy and matter, and chemical reactions require some form of energy (e.g., heat, light, radiation, electric potential, etc.) to proceed. Precise control over chemical reactions is a key to the success of materials synthesis, but currently such control is limited to the manipulations of various reaction parameters including time, energy input, and pressure. These parameters, however, are adjustable only within a certain boundaries defined by the energy source employed in reactions. Each type of energy has its own realm of reaction conditions determined by its inherent reaction parameters.Compared to traditional energy sources, ultrasonic irradiation provides rather unusual reaction conditions (a short duration of extremely high temperatures and pressures in liquids) that cannot be realized by other methods. Interestingly, such extraordinary conditions are not derived directly from ultrasound itself wavelengths are much larger than molecular dimensions. Thus,

molecular level interaction between ultrasound and the chemical species takes place. Instead, acoustic driven by high intensity ultrasound accounts for the chemical effects of ultrasound. When liquids are irradiated with ultrasound, the alternating expansive and compressive acoustic waves creates bubbles (i.e., cavities). The oscillating bubbles can accumulate ultrasonic energy effectively while growing to a certain size. Under the right conditions, a bubble can overgrow and subsequently collapse, releasing the concentrated energy stored in the bubble within a very short time. This cavitational implosion is very localized and transient with a temperature of 5000 K and a pressure of 1000 bar. These extreme conditions created during acoustic cavitation can give rise to light emission. This intriguing physical phenomenon, known as sonoluminescence, was first observed during the ultrasonic irradiation of water in 1934 by Frenzel and Schultes. A variety of sonochemical apparatuses are commercially available with several designs as ultrasonic cleaning baths, directimmersion ultrasonic horns, and flow reactors.

Cleaning baths have insufficient intensity for most applications, but are useful for liquid-solid reactions with easily passivated but reactive solids (e.g., Li, Mg). A typical laboratory-scale sonochemical apparatus which consists of a high-intensity ultrasonic titanium horn driven by a piezoelectric transducer which is directly introduced into a thermostated glass reactor having gas inlets and outlets. Cavitation occurs over a very wide range of frequencies. The chemical effects of ultrasound were explored for many years nearly always in water. Ultrasonic irradiation of aqueous liquids generates free radicals, and the formation of free radicals by sonolysis of water has been particularly well-studied. Major advancements in sonochemistry have been achieved by moving to less volatile organic liquids, so that the bubble contents are dominated by the intended reactants rather than the solvent.

II. METHODS AND MATERIAL

Procedure:

1.Pthalic anhydride to Pthalamide:

a. Routine Procedure:

In round bottom flask 2 gm of pthalic anhydride and 1 gm of urea. Heat the flask in oil bath at 130-135°C for 10-20 mins till the content melt. Effervescence is observed the volume increases and temperature of mixture is also increases. Then stop heating and allow the reaction mixture to cool. Add 10 ml distilled water white ppt. of pthalamide is separate out. Filter it at suction pump. Wash with cold water and dry well.

Green approach: This reaction carried out at sonicator for 05 mins under sonication. Time effective and fuel saving with less hazardous.

2. Pthalamide synthesis by using Thiourea:

a. Routine Procedure:

In round bottom flask 2 gm of pthalic anhydride and 1 gm of urea. Heat the flask in oil bath at 130-135°C for 10-20 mins till the content melt. Effervescence is observed the volume increases and temperature of mixture is also increases. Then stop heating and allow the reaction mixture to cool. Add 10 ml distilled water white ppt. of pthalamide is separate out. Filter it at suction pump. Wash with cold water and dry well.

Green approach: This reaction carried out at sonicator for 05 mins under sonication. Time effective and fuel saving with less hazardous. In sonication reaction time reduced up to 5 mins.

3. Anthracene to 9, 10 dihydro anthracene:

Take 1.6 gm of anthracene and 0.80 gm of Maleic anhydride. Transfer the reagent into 50 ml round bottom flask containing a stir bar. Add 20 ml of xylene in R.B. Start refluxing the round bottom flask. Heat by using heating mantle up to 180°C for 30 mins. After 30 min. let the flask warm to room temperature. Wait for 15 mins. Place the round bottom flask in crushed ice. Then crystal formation is occure. Wash crystal with 5ml of cold xylene.filter the product dry it well and record yield.

Green approach:

Fual saving and instead of Acetic anhydride we used Maleic

4. Pechmann condensation:

Take 1gm of Resorcinol and 1.3ml of ethyl acetoacetate mix them then 5ml of conc. H2SO4 and put into beaker with cold water for cool condition then add it into the above solution drop by drop and kept that mix side to full overnight. Then pour it into the ice cold water filter the separated solid wash with aqueous NaOH filter the solid dry it and recrystallised take its M.P. and TLC

Green approach:

Time period of reaction reduced from 60 to 15 mins.

Reaction 1st:

III. RESULTS AND DISCUSSION

Sr.No	Name of Reaction	Dist. travelled by	Dist. travelled by	Solvent run	Physical
		reactant in cm	product in cm	in cm	Constant
					in ⁰C
01	Pthalic anhydride to	2.5	3.1	5.1	238°C
	Pthalamide				
02	Thiourea to	4.1	3.0	5.3	180°C
	Pthalamide				
03	Anthracene to 9,10	2.9	5.1	6.5	278°C
	dihydro anthracene				
04	Resorcinol to 4-	3.1	4.3	5.8	180°C
	methyl,7-hydroxy				
	Coumarin				

Compound 01	Compound 02	Compound 03	Compound 04	
Pthalic anhydride	Thiourea to	Anthracene to 9,10	Resorcinol to 4-methyl,7-	
to Pthalamide	Pthalamide	dihydro anthracene	hydroxy Coumarin	
Physical Constant:				
238°C	180°C	278°C	180°C	
			•	
MobilePhase:	MobilePhase:	MobilePhase:	MobilePhase:	
n-Hexane	Toluene + E.A (8:2)	n-Hexane +Chloroform	Hexane	
		(8:2)		

IV.CONCLUSION

A diverse set of applications of ultrasound have been explored in the synthesis of different compounds. Ultrasonic irradiation provides unique reaction conditions via acoustic cavitation. Bubbles generated during sonication can effectively accumulate the diffuse energy of ultrasound, and upon collapse, an enormous concentration of energy is released to heat the contents of the bubble. These transient, localized hot spots with extremely high temperatures and pressures are primarily responsible for chemical effects of ultrasound. The usefulness of synthesis as a synthetic tool resides in its versatility. The sonochemical method has been even further extended to the preparation of carbons, polymers, and biomaterials. The major challenges that face a wider application of sonochemistry, however, include issues of scale-up and energy efficiency.

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