

O28: Synthesis of N benzylidene aniline by green chemistry

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Abstract:

Green chemistry provides a solvent free organic synthesis without raising the temperature in order to respect the environment. In this work this new discipline has been adopted to synthesize an imine called Schiff base which N Benzylidene Aniline is created by the condensation of aniline on benzaldehyde in the presence of a catalyst at 0.1%. This synthesis was conducted without using solvent, and without raising the temperature as dictated by the method of green chemistry. The mixture of reagents was placed in a mortar in order to exert pressure to synthesize the imine. At a reaction time of 2 min, the yield obtained is 57%. The yellowish solid product was analyzed by infrared spectroscopy, which confirmed the presence of characteristic bands of the azomethine C = N group at 3057 and 1630 nm⁻¹.

Keywords: Green chemistry, condensation, Schiff base.

Résumé :

La chimie verte permet une synthèse organique sans solvant et sans élévation de température, afin de respecter l'environnement. Dans ce travail cette nouvelle discipline a été adoptée pour synthétiser une imine dite base de schiff appelée N Benzylidene Aniline issue de la condensation de l'aniline sur le benzaldéhyde en présence d'une catalyse à 0.1%. Cette synthèse a été effectuée sans utilisation de solvant, et sans élévation de température comme dicte la méthode de la chimie verte. L'appareil des réactifs a été mit dans un mortier afin d'y exercer une pression pour synthétiser l'imine. A un temps de réaction de 2 mn, le rendement obtenu est de 57%. Le produit solide et jaunâtre a été analysé par spectroscopie infrarouge, qui a confirmé la présence des bandes caractéristiques du groupement azométhine C=N, à 3057 et 1630 nm⁻¹.

Mots clés : chimie verte, condensation, base de Schiff.

Introduction:

Protecting the environment is nowadays the major challenge for the industry and different application domains. The imines compounds are harmless for the human body; that is why the Imination is a way to eliminate the toxic amines from the body [1]. Vitamin B6 is an enzyme which catalyzes transamination or aminotransferase reactions [2]. Green chemistry has enabled the birth of a new imination, solvent-free and without temperature rise, as is the case of the synthesis of

N benzylidene aniline in this work. N benzylidene aniline was synthesized by condensation of aniline on benzaldehyde.

The N benzylidene aniline:

The N benzylidene aniline (Figure 1) or N,1-di(phenyl)methanimine is an imine synthesised by the addition of aniline on benzaldehyde, Schiff base because of the formative aromatic aldehyde, so it is a biological molecule.

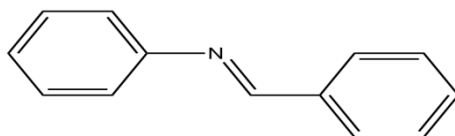


Figure 1: formula of N benzylidene aniline (N,1-di(phenyl)methanimine)

Work's conditions:

Here we are working in green methods, so we work without solvent, without high temperature in order to preserve environment, so we work softly and safely, by mix of the amine and the aldehyde in presence of the catalyst then practice a manual mix with pressure (Figure 2).



Figure 2: work conditions in solventless synthesis

Reaction mechanism:

The formation of the N benzylideneaniline is governed by condensation mechanism; the (Figure 3) shows the creation of the intermediate ion, and the formation of one water molecule.

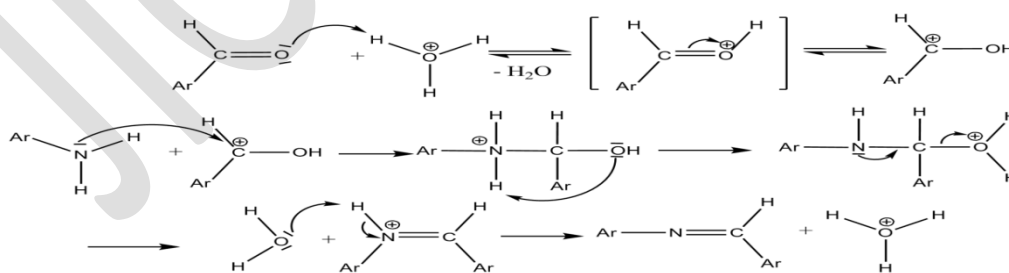


Figure 3: reaction mechanism of formation of N benzylidene aniline

Procedure:

In a mortar put an equimolar quantity of aniline and benzaldehyde in presence of 0.1% of catalyst (FeSO₄), practice pressure in mixing the mixture governed by the formation reaction showed by (Figure 4).

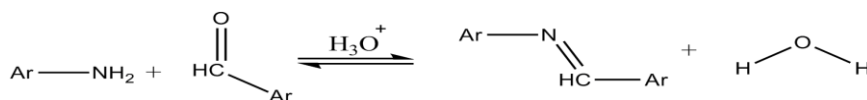


Figure 4: reaction of formation of N benzyldene aniline

We could note that there is a formation of water as well as formation of a solid material (our product), we had to remove the formed water to avoid the hydrolyze of our product. After the end of the synthesis, we recrystallize the product with ethanol, then dry and weighing the final product. The procedure is summary in (Figure 5).

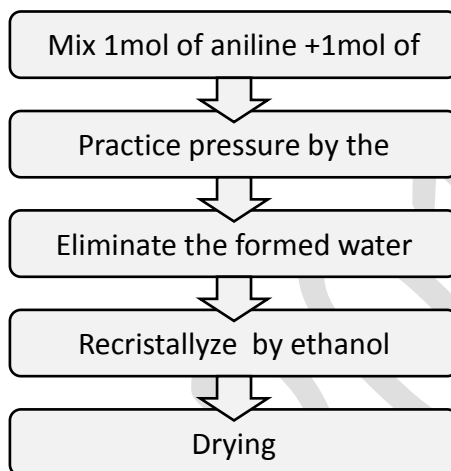


Figure 5: synthesis procedure of N benzyldene aniline

Results:

In this work we synthesis imine which is the N benzyldene aniline, the CCM plate shows that we obtained one product. The results of this manipulation are resumed in (Table 1). The product obtained is a yellow solid, which smell disagreeable. Although it is known that condensation of an amine and aldehyde reaction is slow, but experimentally the preparation of N benzyldene aniline, lasted 2 minutes, with 0.1% FeSO₄ as catalyst.

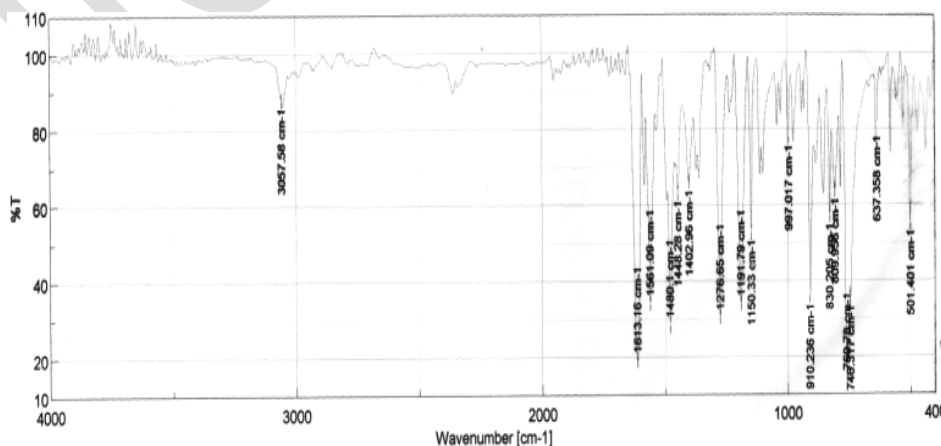


Figure 6: infrared spectrum of N benzyldene aniline

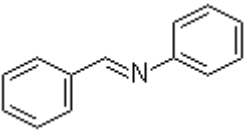
Product Name	N benzylidene aniline
Molecular structure	
Molecular formula	C ₁₃ H ₁₁ N
Molecular weight	181.23
Synthesis reaction	condensation
Catalyst	FeSO ₄
Reaction T°	Room temperature
Purification	Recrystallisation with ethanol
Product color	Yellow
Product smell	disagreeable
Physic state	solid
Melting point T°	52°C
Yield	57%

Table 1: Work conditions and N benzylidene aniline characteristics

Conclusion:

N benzylidene aniline Schiff base was synthesized in this work by green chemistry. Without use of solvent and temperature elevation without the reaction time of the condensation of aniline on benzaldehyde in the presence of acid catalysis is 2mn. The product obtained and recrystallized by ethanol, has been characterized by infrared spectroscopy, which gave characteristic bands at frequencies of 3057 and 1630 nm⁻¹. This synthesis was conducted without solvent to obtain N-(phenylmethylene) benzenamine which is in the form of yellowish crystals in 57%.

Refences:

- [1] A. William Johnson, Invitation à la chimie organique, De Boeck Université, 2002, page465.
- [2] Jonathan Clayden, Chimie organique, De Boeck Supérieur, 2002, page357