



Acetylation Of Aromatic Amines: Use Of Acidic Catalyst For Efficient Reactions

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Abstract:

Vinegar containing acetic acid acts as acid catalyst in Acetylation of amines. Acetylation of different amines was carried out by using vinegar and acetic anhydride as an acetylating agent. Reaction proceeds under normal reaction condition with the formation of product of high yield. The reaction was carried out at room temperature and under solvent free condition. The present methodology illustrates the efficient acetylation of primary amine by vinegar by means of acetic anhydrides in weakly acidic condition at room temperature. Aromatic Amine and vinegar are mixed in a beaker. Acetic anhydride is added to it. When vinegar comes in contact with amine and acetic anhydride formation of acetylated product takes place. Here vinegar serves as active weak water soluble catalyst.

The present methodology illustrates the efficient acetylation of primary amines by vinegar by means of acetic anhydrides under weakly acidic condition at room temperature. The present study offers the new researcher and chemist an alternative method for acetylation of amines. The catalyst does not harm to environment it is eco-friendly and cheaply available.

Keywords: Vinegar, acetylation, acetic acid, amines.

Introduction:

Acetylation of amines is a fundamental organic reaction widely used in chemical synthesis, where an acetyl group ($\text{CH}_3\text{CO}-$) is added to the nitrogen atom of an amine molecule, effectively "protecting" the amine functionality by reducing its reactivity and enabling selective manipulations in multi-step synthesis. This process is particularly valuable in peptide synthesis, drug discovery, and the preparation of various functional molecules, often achieved using reagents like acetic anhydride or acetyl chloride, frequently in the presence of a base catalyst to facilitate the nucleophilic attack of the amine on the electrophilic acetyl group.

However, the most common acetylating reagents used are acetyl chloride, acetic acid, acetic anhydride or any other protic acid. In spite of the traditional reactions, green catalyst is employed.

A variety of methods are now available for acetylation. Most of them have certain demerits such as use of expensive, toxic catalyst, long reaction times, harsh reaction conditions and non-satisfactory yield of the desired products. With increasing environmental concern and the regulatory constraints, the development of environmentally benign organic reactions has become a crucial and demanding area in modern organic chemicals research. The paper reports a practical and convenient method for the preparation of Amine, using vinegar as catalyst.

The present research work described a highly efficient and eco-friendly protocol for acetylation under aqueous condition at room temperature using vinegar.

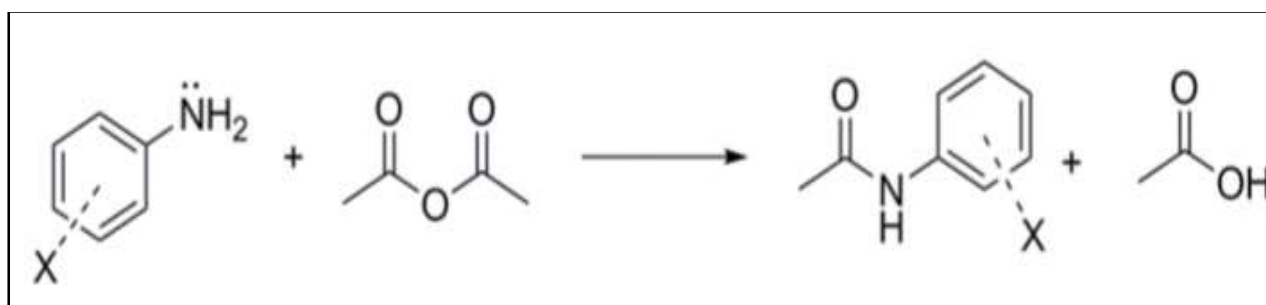
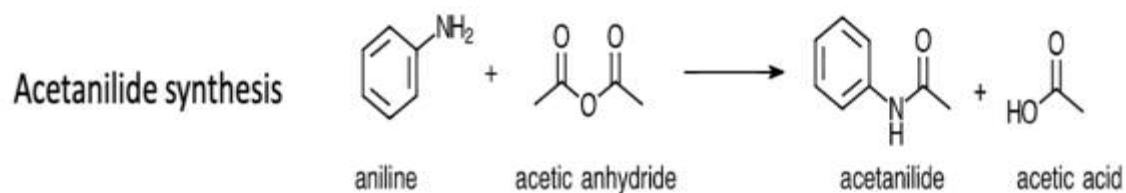


Figure 1:- Acetylation Reaction of Amines

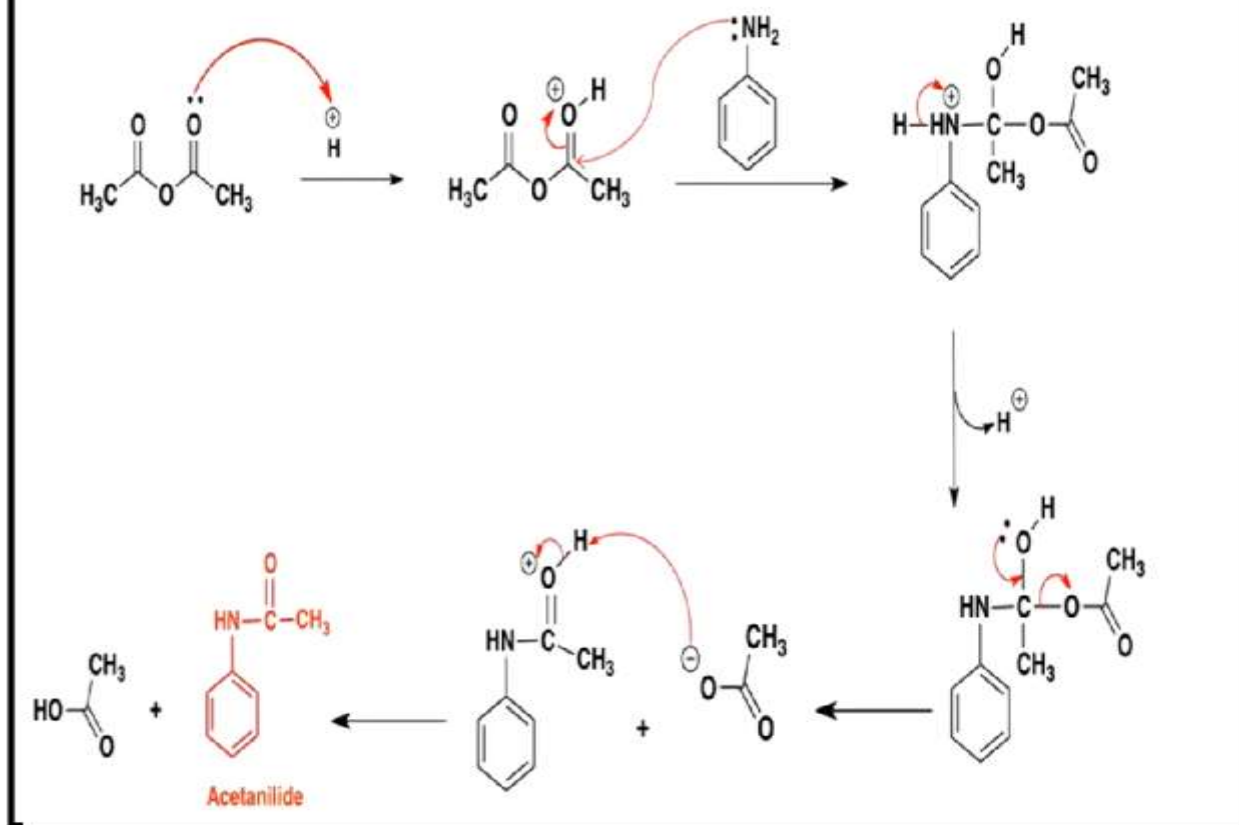
Material and Method:

All the chemicals are of AR grade and distilled before use.

Mix 1g/mL of Aromatic Amine and 1-5 mL of vinegar in a beaker. Add 1-2 mL of Acetic anhydride to it with constant stirring. When the acetic acid in aqueous condition comes in contact with amine and acetic anhydride, formation of acetylated product takes place, acetic acid serves as an active weak water-soluble catalyst. In the reported methodology (Figure 1), the acetylation of aniline is used as a model reaction.



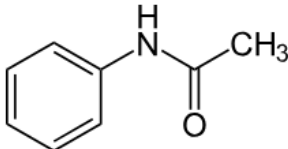
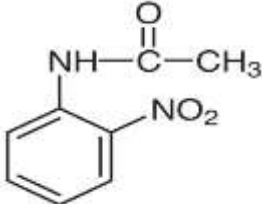
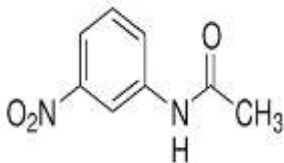
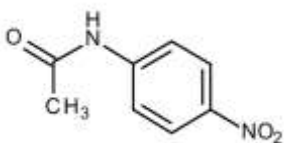
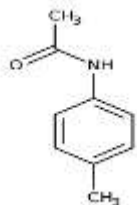
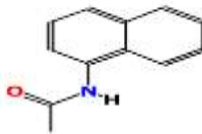
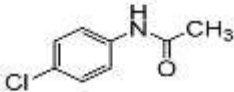
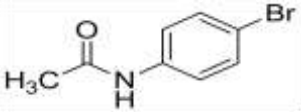
Mechanism



Results and Discussion:

The efficiency of vinegar is to carry out the acetylation of amino group which indicates that vinegar contain the acetic acid which comes in contact with amine and acetic anhydride and forms the acetylated product. From table-1 it is observed that the aromatic amino group converted to acetyl group in high yield using vinegar as catalyst.

Table 1: N-Acetylation of Aromatic Amines

Sr. No.	Substrate	Product	Str	% Yield	M P
1.	Aniline	Acetanilide		82.43%	114°C
2.	o-Nitroaniline	o-Nitro acetanilide		75.38%	90-92°C
3.	m-Nitroaniline	m-Nitro acetanilide		89.23%	151-153°C
4.	p-Nitroaniline	p-Nitro acetanilide		80.76%	214-216°C
5.	p-Toluidine	p-Methyl acetanilide		82.01%	149-151°C
6.	alpha Naphthyl amine	N-Acetyl -1-Naphthyl Amine		93.02%	155-157°C
7.	p-Chloroaniline	p-Chloro acetanilide		95.00%	177-178°C
8.	p-Bromoaniline	p-Bromo acetanilide		88.71%	165°C

Conclusion:

Acetylation of different aromatic amines were carried out by using vinegar and acetic anhydride as an acetylating agent, reaction proceeds under normal reaction condition with the formation of product in high yield. The reactions were carried out with stirring at room temperature and under solvent free condition. The present methodology illustrates the efficient acetylation of primary amines by vinegar by means of acetic anhydrides under weakly acidic condition at room temperature. The present study offers the new researcher and chemist an alternative method for acetylation of amines. The catalyst does not harm to environment it is eco-friendly and cheaply available.

In summary, we have developed a convenient and general method for the acetylation of amines in the absence of solvent. The experimental conditions were milder, and the reactions were completed in shorter reaction times and at room temperature.

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