

A mild, efficient and green route for acylation of alcohols and phenols with acetic anhydride and Na-Y zeolite.

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Abstract: A new zeolite catalyst acylation of alcohols and phenols is developed. It is highly efficient method and the Na-Y zeolite is a reusable catalyst, hence it provides and green route in synthetic organic chemistry.

Keywords: Na-Y zeolite, Green route, acylation.

I. Introduction

Use of protective groups is an important method in organic chemistry [1]. Protection of alcohols and phenols as their corresponding ethers or acetals/ketals is a well known method for protection of hydroxyl group. Hydroxyl group of alcohol/phenols can be protected as an ester with acetic anhydride and conc. sulphuric acid. This method is not clean and dehydration is a main competing reaction when sulphuric acid is used under refluxing condition. To overcome these problems, mild acidic catalysts are needed.

In recent years organic reactions on solid supports such as zeolites [2], molecular sieves [3] have been used because of their catalytic properties.

The zeolites are mildly acidic, highly selective and environmental friendly catalysts. The H-Y zeolite [4], MCM-41 [5] and other porous materials have been already used as catalyst for protection of alcohols and phenols as their ethers. Zeolite H-beta has been used as a catalyst in organic chemical conversions such as alkylation [6], ketal-acetal formation etc.

II. Present work

In this letter, we like to report the acylation of alcohols and phenols using Na-Y zeolite as a reusable acid catalyst as shown in table 1 [7]

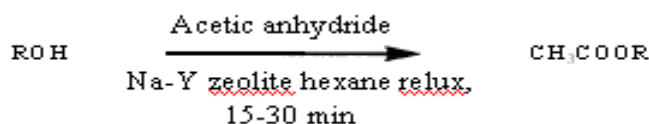


Table 1 Zeolite Na-Y catalysed acylation of alcohols and phenols

S. No.	Alcohol/Phenol	Reaction Time (min)	Na-Y zeolite (g)	Percentage yield
1	Cyclohexanol	15	10	90
2	Cholesterol	10	10	92
3	Phenol	15	10	95
4	Benzyl alcohol	10	10	96
5	2- Naphthol	15	10	90
6	4-nitro Phenol	30	20	70
7	4-choloro Phenol	20	10	92
8	Cinnamyl alcohol	15	10	94

III. Experimental section

Acylation was performed by refluxing a mixture alcohols or phenols (1 mmol), acetic anhydride (1.2 mmol) in hexane (10 mL) in the presence of Na-Y zeolite (10-20 mg). After the conversion was finished, the reaction mixture was filtered through whatmann filter paper. The filtrate was concentrated and crude product was purified by vacuum distillation or column chromatography. Aromatic phenols were found to be less reactive than aliphatic alcohols towards acylation. The Na-Y zeolite can be reused for the acylation without conducting any activation by calcinations. It can be recycled for at least three times. The yields of the products are almost quantitative. In conclusion Na-Y zeolite is a mild acid catalyst and can be used for organic functional group transformations. The advantage of this catalyst is that it is commercially available at cheaper price. It provides an ecofriendly and green route for acylation of alcohol/phenols.

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- [7] This catalyst is reported to have Bronsted acid sites in the micropores and on the external surface, and Lewis acid sites at the internal surface due to local defects.