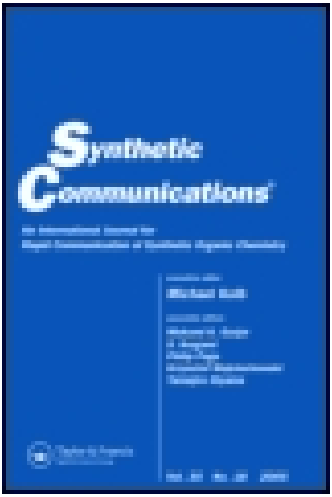

Synthetic Communications: An International Journal for Rapid Communication of Synthetic Organic Chemistry
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/lsyc20

Synthesis of 4-Arylidene-2-Phenyloxazol-5-Ones Using 1:1 Mixture of Al_2O_3 -H_3BO_3

Jyotimoni Kashyap [a] , A. B. Chetry [a] & Pranab J. Das [a]

[a] Department of Chemistry , Gauhati University , Guwahati, 781 014, India

Published online: 11 Mar 2009.

To cite this article: Jyotimoni Kashyap , A. B. Chetry & Pranab J. Das (1998) Synthesis of 4-Arylidene-2-Phenyloxazol-5-Ones Using 1:1 Mixture of Al_2O_3 -H_3BO_3 , Synthetic Communications: An International Journal for Rapid Communication of Synthetic Organic Chemistry, 28:22, 4187-4191, DOI: 10.1080/00397919809458699

To link to this article: http://dx.doi.org/10.1080/00397919809458699

SYNTHETIC COMMUNICATIONS, 28(22), 4187–4191 (1998)

SYNTHESIS OF 4-ARYLIDENE-2-PHENYLOXAZOL-5-ONES USING 1:1 MIXTURE OF Al_2O_3 -H_3BO_3

Jyotimoni Kashyap, A.B. Chetry, Pranab J. Das*

Department of Chemistry, Gauhati University
Guwahati - 781 014, India

Abstract : Cyclodehydration-condensation of hippuric acid and arylaldehydes have been carried out using a 1:1 mixture of Al_2O_3-H_3BO_3 in the presence of stoichiometric quantity of acetic anhydride to give the target compound in good yield. This procedure can be used to synthesize the 4-alkylidene analogs also.

Cyclodehydration is a popular method for the synthesis of several heterocyclic compounds[1-3]. These reactions are often carried out in the homogenous phase requiring elaborate purification procedures. A simple procedure for carrying out cyclodehydration under biphasic condition is reported here.

4-Arylidene-2-phenyloxazol-5-ones are intermediates for the synthesis of non-proteinous amino acids[4-6] and homologation of carboxylic acids[7]. Usual method for their synthesis is the cyclodehydration-condensation of hippuric acid and an aromatic aldehyde. The synthesis have been carried out using acetic anhydride and fused sodium acetate[8]. The alkylidene analogs are synthesized under the same condition using lead

acetate instead of sodium acetate. The yield, however, is generally low and their isolation requires elaborate workup. The yield is also found to be highly sensitive to variation in the reaction temperature. Other methods that are available includes the use of SO_3 in DMF[9] and polyphosphoric acid[10]. Use of PPA is reported to give better yield, however, insolubility of several substrates in PPA makes the procedure, less attractive.

In recent years, a lot of interest is being given to reaction carried out under biphasic condition. The advantages reported are mild reaction conditions, high yield and easy recovery of products. Herein is reported a much simplified synthesis of the 4-arylidene-2-phenyloxazol-5-ones and the alkylidene analogs in biphasic condition by the reaction of several aromatic aldehydes with hippuric acid using a 1:1 mixture by weight of neutral alumina and boric acid in the presence of stoichiometric amount of acetic anhydride in refluxing toluene or benzene solution. Although alumina, boric acid and acetic anhydride are individually good dehydrating agents, the cyclodehydration reaction, reported here, could not be carried out in the absence of any one of them. To our knowledge a 1:1 mixture of Al_2O_3 -H_3BO_3 have not been used earlier as a reagent for cyclodehydration.

The yield of the oxazolone is about 80 - 90% and isolation requires simple filtration to remove the solid Al_2O_3 -H_3BO_3 mixture followed by removal of solvent. The Al_2O_3 -H_3BO_3 could be reused. In all the previously reported methods of synthesis acetic anhydride was used in substantial quantity requiring repeated washing with water to remove the last trace of acetic anhydride/acetic acid. Oxazolones are reported to be susceptible to easy acid hydrolysis and it is possible that recovery procedure decreases the yield considerably. Further, use of excess acetic anhydride makes the yield sensitive to reaction temperature[8]. In the method reported herein stoichiometric quantity of acetic anhydride is required and consequently yield of the oxazolone is high. Temperature dependence of the

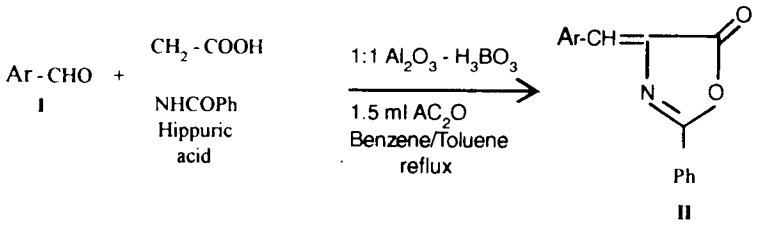

Table - 1

Sl. No.	I	Colour	m.p.°c of II obs	m.p.°c of II lit	Yield of II
1.	Benzaldehyde	Yellow	167	168[12]	82%
2.	Anisaldehyde	Yellow	156	156[12]	86%
3.	4-Dimethylamino benzaldehyde	Red	211	213-214[13]	91%
4.	4-Chlorobenzaldehyde	Yellow	184	185[10]	88%
5.	4-Nitrobenzaldehyde	Yellow	241	245[10]	82%
6.	2,6-Dichlorobenzaldehyde	Yellow	158	159[13]	76%
7.	Furfuraldehyde	Yellow	170	171[12]	78%
8.	Crotonaldehyde	Yellow	152	148[15]	82%
9.	Cyclohexanone	Yellow	139	139[14]	81%

yield can also be overcome, as evident from the observation that the yield remained almost same when benzene or toluene was used as the solvent.

In view of the above advantages, this method appears to be a better method for the synthesis of 4-arylidene-2-phenyloxazol-5-ones. Two aliphatic carbonyl compounds namely cyclohexanone and crotonaldehyde also gave the

corresponding oxazolones under the same condition. However, acetone and acetaldehyde failed to give the desired products probably because their boiling points were below the reflux temperature. The reaction is shown in scheme 1 and the physical characteristics of products given in Table 1.

The products were identified by comparing the melting points with the ones reported in literature.

Experimental Hippuric acid, neutral alumina, boric acid, aromatic aldehydes, cyclohexonone, and crotonaldehyde were purchased from Lobachemie (India) and were used without further purification.

An intimate mixture of 1:1 by weight of neutral alumina and boric acid was fused before use. To 100 ml of toluene, 5g of a 1:1 mixture of Al_2O_3 - H_3BO_3 was added and refluxed for about 20 minutes using a water separator. To this was added 0.01 moles of hippuric acid and 0.01 mole of the carbonyl compound. The mixture was refluxed for another 20 minutes. To the hot solution was added 1.5 ml of acetic anhydride dropwise within 5 minutes and the mixture was further refluxed for about 10 minutes, the colour of the solution turned yellow, in the case of p-dimethylaminobenzaldehyde the colour of the solution turned red. The reaction mixture was cooled, filtered to remove the Al_2O_3 - H_3BO_3 and removal of the solvent from the filtrate gave the products. A small amount of the product was recrystallized from DMF and identified by comparing their m.p. reported in literature. The reaction could also be carried out in benzene instead of toluene with very little change in the % yield.

The results indicate that oxazolones can be synthesized by a cyclodehydration reaction using a 1:1 mixture by weight of alumina-boric acid. Stoichiometric quantity of acetic anhydride is necessary to effect the cyclodehydration unlike the procedures reported earlier. Since the reaction is carried out in biphasic condition product recovery is simple. Finally, this method can be used for the synthesis of the 4-substituted oxazolones of both aromatic as well as the aliphatic carbonyl compounds provided the reflux temperature is not above the boiling point of the aliphatic carbonyl compound used.

The authors are grateful to the Head, Department of Chemistry, Gauhati University for providing laboratory facilities.

References and notes

1. Birch, A.J.; Joeger, R.; Robinson,R.; J. Chem. Soc. **1945**, 582
2. Birch, A.J.; Subba Rao, G.S.R; Tetrahedron Letters **1967**, 2763
3. Kollonitsch, J.; Rosegay, A.; Chem. & Ind.**1964**, 1867
4. Cornforth, J.W.; "*oxazolones*" in *Heterocyclic Compd.* R.C.Elderfield, ed, vol.5, Wiley, N.Y. **1957**, 336
5. Filler,R. and Rao, Y.S.; J.Heterocyclic Chem. **1964**, 1,153
6. Badshah, A.; Khan N.H.; Kidwai A.R.; J.Org.Chem. **1972**, 37,2916
7. Steglich,W.; Gruber,P.; Angew Chem. Int. Ed. **1971**, 10,655.
8. Baltazzi,E.; Quart. Rev. IX **1955**, 150.
9. Baltazzi,E.; Davis,E.A.; Chem. and Ind. (London) **1962**, 929.
10. Rao, Y.S.; J.Org. Chem. **1976**, 41,722.
11. Vogel's Textbook of Practical Org.Chem.; ELBS Longmann, 4th - Ed. **1978**, P884.
12. Crawford,M.; Little, W.T.; J.Chem.Soc. **1959**, 729.
13. Schueler, F.W.; Wang S.C.; J.Am. Chem. Soc. **1950**, 72,2220
14. Boekelherde, V.; Schramm, L.M.; J.Org.Chem. **1949**, 17,298.
15. Oxazolone was prepared by established method using Ac_2O and NaOAc and m.p. of product compared with those obtained by the procedure reported here.

(Received in the U.S.A. 01 June 1998)