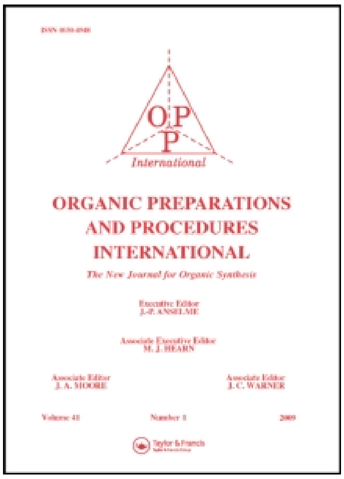


Organic Preparations and Procedures International
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t902189982

2,5,5-TRIMETHYL-2-OXAZOLINE

S. P. McManus[a]; J. T. Carroll[a]; P. M. Grohse[a]; C. U. Pittman Jr.[b]
[a] Department of Chemistry, University of Alabama in Huntsville, Huntsville, Alabama [b] Department of Chemistry, University of Alabama, University, Alabama

To cite this Article McManus, S. P. , Carroll, J. T. , Grohse, P. M. and Pittman Jr., C. U.(1969) '2,5,5-TRIMETHYL-2-OXAZOLINE', Organic Preparations and Procedures International, 1: 4, 235 — 238
To link to this Article: DOI: 10.1080/00304946909458389
URL: http://dx.doi.org/10.1080/00304946909458389

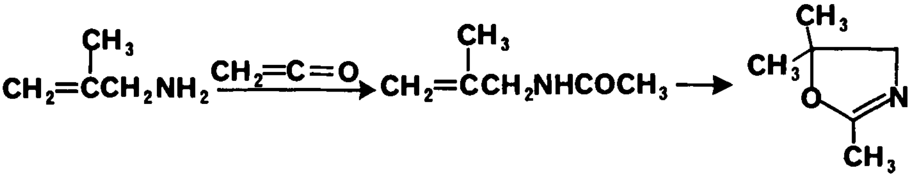
ORGANIC PREPARATIONS AND PROCEDURES 1(4), 235-238 (1969)

2,5,5-TRIMETHYL-2-OXAZOLINE[1]

S. P. McManus[2], J. T. Carroll and P. M. Grohse[3]
Department of Chemistry
University of Alabama in Huntsville, Huntsville, Alabama 35807

and

C. U. Pittman, Jr.
Department of Chemistry
University of Alabama, University, Alabama 35486



A general procedure for preparing 2,5,5-trisubstituted-2-oxazolines is illustrated with the synthesis of 2,5,5-trimethyl-2-oxazoline. Allylic amides, substituted to give tertiary carbonium ions upon C-protonation, cyclize rapidly and quantitatively to protonated oxazolines in strong acids.[4] Drowning the acid solutions into dilute base gives the oxazoline. The isolated yields range from 41 to 70%. 2-Oxazolines which have been prepared in a manner similar to that described here are listed in the Table.

This method is not normally described[5] as a good general procedure for the preparation of 2-oxazolines. While the sluggish reactivity of allylic amides unsubstituted at the β-position[6] partly accounts for the poor early results, the difficulty in obtaining appropriately substituted amines also discouraged use of this reaction.[5] In view of our results and the commercial availability of the amines or amine precursors, this procedure must now be considered as a general method for the preparation of many types of 2-oxazolines.

Table

Amide	2-Oxazoline	% Yield (Ref.)
N-(β-Methallyl)formamide[a]	5,5-Dimethyl	41(7)
N-(β-Methallyl)acetamide	2,5,5-Trimethyl	65[b], 50(8)
N-(β-Methallyl)propionamide	5,5-Dimethyl-2-ethyl	44(8), 49(9)
N-(β-Methallyl)benzamide[c]	5,5-Dimethyl-2-phenyl	70(7)[d]
N-(β-Phenylallyl)benzamide[c]	5-Methyl-2,5-diphenyl	60(7)
N-(1-Cyclohexenylmethyl)acetamide	2-Methyl-5,5-pentamethylene	57(10)

[a] Prepared in 70% yield by reacting equimolar quantities of the amine with ethyl formate, c.f. J. Moffat, M. V. Newton and G. J. Papenmaier, J. Org. Chem., 27, 4058 (1962). [b] Reported here. [c] Prepared by the Schotten-Bauman procedure, c.f. A. I. Vogel, "Textbook of Practical Organic Chemistry", 3rd Edition, p. 582, Longmans, London, 1956. [d] Used 90% H_2SO_4. (All compounds in this table have been fully characterized to include unambiguous structure proof; see refs. for details.)

Experimental

N-(β-Methallyl)acetamide An excess of ketene from a Williams-Hurd generator[11] was passed through a solution of 17.8 g. (0.25 moles) of β-methallylamine[12] in 125 ml. of anhydrous ether at room temperature. The ether was removed *in vacuo* at room temperature by use of a rotary evaporator. Distillation of the liquid residue afforded 25.8 g. (91%) of N-(β-methallyl)acetamide, b.p. 105°/4.5 mm (lit.[8] b.p. 123°/21 mm).

2,5,5-Trimethyl-2-oxazoline To 40 ml. of conc. sulfuric acid, stirred with an efficient magnetic stirrer and maintained below 10° by an ice bath, was added dropwise 22.6 g. (0.20 moles) of N-(β-methallyl)acetamide. After the addition was complete, the ice bath was removed and stirring was continued for an additional 45 min. A 2 l. three-necked flask was fitted with a mechanical stirrer and to it was added a cooled solution of 67.5 g. of sodium hydroxide in 650 ml. of water. On top of the base solution was added 250 ml. of a 50:50 mixture of petroleum ether (b.p. 30-60°) and ethyl ether. The flask was submerged in an ice bath and the contents were vigorously stirred as the sulfuric acid solution was carefully added.[13] After continuous stirring for an additional five minutes, the layers were separated and the organic phase was dried over anhydrous sodium sulfate and then stored overnight in a flask containing some sodium hydroxide pellets.[14] After the ether had been distilled, 2,5,5-trimethyl-2-oxazoline was collected at 120-121°. The yield of pure 2,5,5-trimethyl-2-oxazoline[16] (n_D^{25} 1.4188) was 14.7 g. (65%) (lit.[8] b.p. 120-121, n_D^{25} 1.4188).

References

1. Acid Catalyzed Cyclization Reactions, IV. For paper III, see S. P. McManus, Chem. Commun., 235 (1969).

2. (a) Author to whom inquiries should be addressed. (b) Acknowledgement is made for partial financial support from the Petroleum Research Fund, administered by the American Chemical Society, and from the National Aeronautics and Space Administration.

3. Petroleum Research Fund Undergraduate Scholar.

4. C. U. Pittman, Jr., and S. P. McManus, 20th Southeastern Regional Meeting, American Chemical Society, Tallahassee, Fla., Dec. 4-7, 1968, Abstracts, p. 70.

5. (a) W. Seeliger, E. Aufderhaar, W. Diepers, R. Feinauer, R. Nehring, W. Thier and H. Hellmann, Angew. Chem. Internat. Edit., 5, 875 (1966). (b) R. H. Wiley and L. L. Bennett, Chem. Rev., 44, 447 (1949).

6. S. P. McManus, et. al., Org. Preps. and Proc., 1, 183 (1969).

7. S. P. McManus, J. T. Carroll, P. M. Grohse, C. R. Taddei and C. U. Pittman, Jr., 20th Southeastern Regional Meeting, American Chemical Society, Tallahassee, Fla., Dec. 4-7, 1968, Abstracts, p. 69; in preparation for publication.

8. P. E. Fanta and A. S. Deutsch, J. Org. Chem., 23, 72 (1958).

9. H. L. Wehrmeister, ibid, 30, 664 (1965).

10. P. B. Talukbar and P. E. Fanta, ibid, 24, 526 (1959).

11. J. W. Williams and C. D. Hurd, ibid, 5, 122 (1940).

12. Obtained from Peninsular Chemresearch, Inc., and used without further purification.

13. Some 2-oxazolines and most 5,6-dihydro-4H-1,3-oxazines are sensitive to hydrolysis in dilute acid. By using this work-up procedure, the product is not exposed to intermediate pH ranges and is extracted into the organic layer shortly after being neutralized. This method causes an increase in yield of at least 5% over that obtained by adding base to the acid solution.

14. 2-Oxazolines and similar compounds are very hygroscopic. Sodium hydroxide pellets[15] and sodium metal[9] are used to remove the water.

15. A. I. Meyers, J. Org. Chem., 25, 145 (1960).

16. Cyclic imino ethers polymerize fairly readily and should be stored in a clean container in a cold place; c.f. T. G. Bassiri, A. Levy and M. Litt, Polymer Letters, 5, 871 (1967).

(Received April 10, 1969, in revised form July 14, 1969)