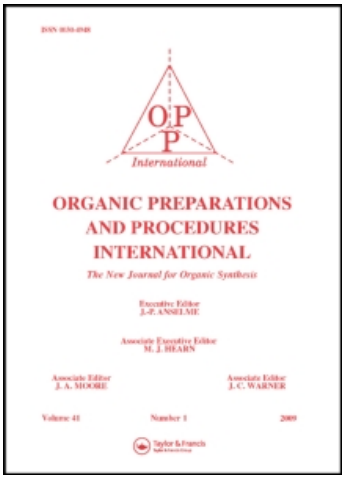


Organic Preparations and Procedures International
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t902189982

A CONVENIENT SYNTHESIS OF 2-PHENYL-2-THIAZOLIN-5-ONES

Nobutaka Suzuki[a]; Yasuji Izawa[a]
[a] Department of Chemistry Faculty of Engineering, MIE University, Tsu, JAPAN

To cite this Article Suzuki, Nobutaka and Izawa, Yasuji(1981) 'A CONVENIENT SYNTHESIS OF 2-PHENYL-2-THIAZOLIN-5-ONES', Organic Preparations and Procedures International, 13: 5, 360 — 363
To link to this Article: DOI: 10.1080/00304948109356140
URL: http://dx.doi.org/10.1080/00304948109356140

REFERENCES

1. J. D. Woodyard, P. R. Morris and G. D. Hobbs, J. Heterocyclic Chem., 17, 1097 (1980).

2. F. R. Jensen and D. B. Patterson, Tetrahedron Lett., 3837 (1966).

3. J. D. Woodyard and P. R. Morris, Org. Prep. Proced. Int., 5, 275 (1973).

4. J. E. Hodgkins, J. D. Woodyard, and D. L. Stephenson, J. Am. Chem. Soc., 86, 4080 (1964).

5. N. B. Colthup, L. H. Daly, and S. E. Wiberley, "Introduction to Infrared and Raman Spectroscopy," Academic Press, New York, 1969, p. 198.

6. A. R. H. Cole, J. Chem. Soc., 3807 and 3810 (1954).

7. M. T. Rogers, J. Am. Chem. Soc., 69, 2544 (1947).

8. J. D. Oliver, J. D. Woodyard, P. E. Rush and J. R. Curtis, J. Heterocyclic Chem., 11, 1125 (1974).

9. G. L. Closs and J. J. Coyle, J. Org. Chem., 31, 2759 (1966).

10. V. M. Mićović and M. Lj. Mihailović, ibid., 18, 1190 (1953).

11. Analysis by vpc was accomplished on a 6 ft. by 0.25 in. 10% Ucon 50 HB 2000 (polar) column operated at 175°.

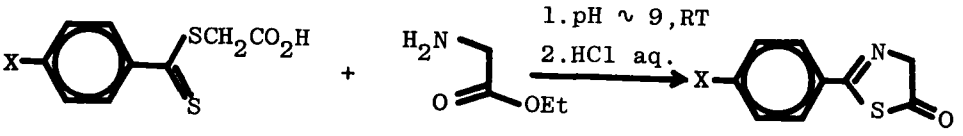
A CONVENIENT SYNTHESIS OF 2-PHENYL-2-THIAZOLIN-5-ONES

Submitted by (10/27/80) Nobutaka Suzuki* and Yasuji Izawa

Department of Chemistry
Faculty of Engineering
MIE University
Tsu 514, JAPAN

2-Aryl-2-thiazolin-5-ones,[1] a sulfur analogue of azlactones, form

an important class of heterocyclic compounds, which can be converted into α-amino acids and their derivatives in good yields.[2] There exist a few general methods for the synthesis of 2-aryl-2-thiazolin-5-ones, *i.e.*, cyclization of thioacylamino acids which are prepared by condensation of methyl alkanedithioate with amino acids in the presence of acetic anhydride or phosphorus tribromide.[3] In the presence of benzaldehyde and acetic anhydride, N-[benzyl(thiocarbonyl)]glycine and related compounds cyclize to give a 4-benzylidene-thiazolin-5-one.[4] Similar products are formed (37-59%) by the action of thioacids on the benzylidene derivatives of 2-oxazolin-5-ones (azlactones).[5] These methods are, however, two-step syntheses starting from amino acids. This paper describes a new one-step, good yield synthesis of 2-aryl-2-thiazolin-5-ones by treatment of carboxymethyl dithiobenzoates (I) with glycine ethyl ester (II) in weakly basic ethanol at room temperature.



I II III

a) X = H b) X = Cl

The isolation of methyl N-thiobenzoylglycine in 68% yield from treatment of Ia with glycine methyl ester in neutral media,[6] suggests that our reaction proceeds through similar intermediates which possibly cyclized under the work-up conditions.

EXPERIMENTAL

All the mps are uncorrected. The following instruments were used: IR: JASCO IR-G; UV: Shimadzu UV-200; NMR: JEOL JNM-MH-100 (100 MHz); MS: JEOL JMS-D-100. Carboxymethyl dithiobenzoate (Ia) and p-chlorodithiobenzoate (Ib) were prepared as described in our previous papers.[7a] *Commer-*

cial glycine ethyl ester·HCl (II) was used without any purification (Nakarai Chem. Co.). EtOH was flushed with nitrogen gas for 1 hr. before use.

General Method.- To a solution of the dithiobenzoate (I)(1.01 mmol) and glycine ester·HCl (II)(1.1 mmol) in EtOH (40 ml) was added 4 ml of aqueous 1N NaOH (4 mmol; pH ∿ 9) at room temperature. While the mixture was stirred for 3 hrs under slightly reduced pressure (aspirator), the reddish color of the solution changed to yellow. The mixture was acidified with 1N HCl to pH ∿ 4, about 40 ml of saturated NaCl was added, and the mixture was extracted with ethyl acetate. Evaporation and recrystallization from benzene afforded pale yellow crystals of III as their HCl salts. The yields are reported below. The products were identified by the mp of the HCl salt of IIIa[3] and by elemental analysis for IIIb. All spectral data (IR, NMR, MS, and UV) supported the structures.

2-Phenyl-2-thiazolin-5-one (IIIa) as pale yellow leaflets, yield 70%, mp. 148-150°, lit.[3] 149° as HCl salt; MS (*m/e*): 177 (M^+); ν_{max}(KBr): 3250, 1720, 1710, and 1520 cm^{-1}; λ_{max}(EtOH) 287.5 nm (ε 11,000); δ^{TMS}_{ppm} (DMSO-d_6) 4.42 (2H, d, J = 6 Hz, $=\overset{+}{N}H\text{-}CH_2\text{-}$), 7.68 (3H, m, arom), 7.82 (2H, m, arom), and 10.48 (1H, br., $=\overset{+}{N}H\text{-}$).

2-(p-Chlorophenyl)-2-thiazolin-5-one (IIIb) as pale yellow leaflets, yield 82.5%, mp. 164.5-165.5° (dec.). Anal. calcd. for $C_9H_6ClNOS\cdot HCl$: C, 43.53; H, 2.84; N, 5.65%. Found: C, 43.50; H, 2.82; N, 5.61%. MS (*m/e*): 211 (M^+) and 213 (M + 2); ν_{max} (KBr) 3250, 1720, 1710, and 1525 cm^{-1}; λ_{max} (EtOH): 299sh (ε 10,500); 288 (11,350); 272 (13,000); δ (DMSO-d_6): 4.36 (2H, d, J = 6 Hz, changed to singlet on D_2O addition, $=\overset{+}{N}H\text{-}CH_2\text{-}$), 7.42 (2H, d, J = 8.5 Hz, arom), 7.74 (2H, d, J = 8.5 Hz, arom), and 10.44 (1H, br., disappeared on D_2O addition, $=\overset{+}{N}H\text{-}$).

REFERENCES

† Convenient Syntheses of Heterocycles. 4. Previous papers see reference 7.

1 R. C. Elderfield, "Heterocyclic Compounds", Vol. 5, p. 547, Wiley, New York, N. Y., 1957.

2 A. I. Meyers, "Heterocycles in Organic Synthesis", p. 255, Wiley, New York, N. Y., 1974.

3 (a) J. B. Jepson, A. Lawson, and V. D. Lawton, *J. Chem. Soc.*, 1791 (1955), no description on the yields; (b) H. Muxfeldt, J. Behling, G. Grethe, and W. Rogalski, *J. Am. Chem. Soc.*, **89**, 4991 (1967).

4 H. T. Clarke, J. R. Johnson, and R. Robinson, "The Chemistry of Penicillin", p. 848, Princeton University Press, Princeton, N. J., 1949.

5 H. Behringer and H. W. Stein, *Chem. Ber.*, **82**, 209 (1949).

6 A. Kjaer, *Acta Chem. Scand.*, **4**, 1347 (1950).

7 (a) N. Suzuki and Y. Izawa, *Tetrahedron Lett.*, 1863 (1974); *Bull. Chem. Soc. Japan*, **49**, 3155 (1976); (b) N. Suzuki, T. Yamabayashi, and Y. Izawa, *ibid.*, **49**, 353 (1976).

PREPARATION OF 2-ISOCYANATO-5-CHLOROBENZOYL CHLORIDE

Submitted by B. K. Misra, Y. R. Rao and S. N. Mahapatra*
(9/2/80)
Regional Research Laboratory
Bhubaneswar-751013, INDIA

In our studies[1,2] on the reactions of 2-isocyanato benzoyl chlorides(I), we were required to prepare the 5-chloro-derivative(Ib). Its preparation (in 31% yield) from 6-chloro isatoic anhydride(IIb) by the action of thionyl chloride takes