CHEMISTRY LETTERS, pp. 707-708, 1982.

SYNTHESIS OF AZULENO[2,1-d]THIAZOLE

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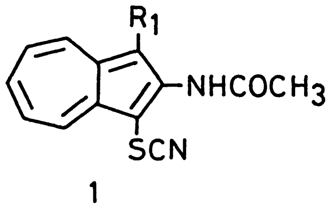
Azuleno[2,1-d]thiazoles were obtained by the deamination of 2-aminoazuleno[2,1-d]thiazoles, which were synthesized by the treatment of ethyl 2-acetylamino-3-thiocyanatoazulene-1-carboxylate with base or aluminum oxide.

The azulenoid heterocyclic compounds which consist of the azulene ring condensed with heterocyclic aromatics are of interest not only in their physical properties and chemical behavior, but also in their physiological activities. Several azulenes fused with heterocycles have been known.$^{1)}$ This communication describes the synthesis of azuleno[2,1-d]thiazole (2a) via 2-aminoazuleno[2,1-d]thiazoles.

The treatment of ethyl 2-acetylamino-3-thiocyanatoazulene-1-carboxylate (1b) with an aqueous potassium hydroxide solution in THF-Et_2O formed the thiazole ring by annelation to give ethyl 2-aminoazuleno[2,1-d]thiazole-9-carboxylate (2d) [dark purple prisms, mp 266 °C (dec)] in 97% yield. The same compound was also obtained by the treatment of 1b with an alumina column in 90% yield. Heating of 2d in 100% phosphoric acid at 90 °C resulted in deethoxycarbonylation to give 2-aminoazuleno[2,1-d]thiazole (2c)$^{2)}$ [green micro prisms, mp 235 °C (dec)] in 98% yield. The treatment of 1a with an alumina column also gave 2c. The spectral data (^1H NMR and IR spectra) shows that 2d exists in the amino form.



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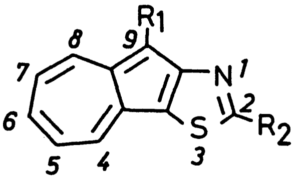
a: R_1 = H
b: R_1 = $COOC_2H_5$



2

a: R_1 = H, R_2 = H
b: R_1 = $COOC_2H_5$, R_2 = H
c: R_1 = H, R_2 = NH_2
d: R_1 = $COOC_2H_5$, R_2 = NH_2

The replacement of the 2-amino functionality with hydrogen was accomplished by use of the following procedure.$^{3)}$ The compound 2d was diazotized with a concentrated aqueous sodium nitrite solution in 85% phosphoric acid and treated with hypophosphorous acid to give ethyl azuleno[2,1-d]thiazole-9-carboxylate (2b) [greenish blue leaves, mp 128-128.5 °C] in 19% yield. The compound 2b, on heating with 100% phosphoric acid at 90 °C, gave azuleno[2,1-d]thiazole (2a) [blue plates, mp 113-114 °C] in ca 100% yield. The spectral data of 2a-d are shown in Table 1.

Table 1. Spectral Data of Azuleno[2,1-d]thiazoles

	IR(KBr) cm^{-1}; ES λ max nm(log ε); ^1H NMR($CDCl_3$) δ ppm; ^{13}C NMR($CDCl_3$) δ ppm
2a:	IR 3044, 1576, 1453, 1388, 1183, 794 ES(in cyclohexane) 225(3.97), 234(3.96), 296(4.83), 334(3.40), 349(3.71), 365(3.84), 380(3.17), 615(2.60), 650(2.53), 671(2.58), 715(2.19), 774(2.28) ^1H NMR(90 MHz) 7.0-7.7(3H, m, H-5,6,7), 7.65(1H, s, H-9), 8.29(1H, dm, J=9.0Hz, H-4), 8.33(1H, dm, J=10.4Hz, H-8), 9.15(1H, s, H-2) ^{13}C NMR(22.5MHz) 107.8(d, C-9), 122.0(s, C-3a), 123.0(d, C-5), 123.3(d, C-7), 130.6(s, C-3b), 133.8(d, C-4), 136.7(d, C-6), 138.1(d, C-8), 142.9(s, C-8a), 159.5(d, C-2), 166.5(s, C-9a) MS 185($M^{\cdot +}$)
2b:	IR 3050, 2974, 2894, 1691, 1451, 1415, 1391, 1237, 1215, 1103, 1098, 780 ES(in cyclohexane) 213(4.36), 311(4.73), 323(4.74), 376(3.89), 396(3.81), 580(2.58), 628(2.53), 692(2.07) ^1H NMR(90 MHz) 1.54(3H, t, J=7.0Hz, $COOCH_2C\underline{H}_3$), 4.60(2H, q, J=7.0Hz, $COOC\underline{H}_2CH_3$), 7.2-8.0(3H, m, H-5,6,7), 8.51(1H, dm, J=9.1Hz, H-4), 9.31(1H, s, H-2), 9.86 (1H, dm, J=10.2Hz, H-8) ^{13}C NMR(22.5MHz) 14.9(q, $COOCH_2C\underline{H}_3$), 60.3(t, $COOC\underline{H}_2CH_3$), 107.1(s, C-9), 123.2 (s, C-3a), 127.2(d, C-5), 128.6(d, C-7), 133.0(s, C-3b), 135.7(d, C-4), 138.7(d, C-6), 139.2(d, C-8), 145.5(s, C-8a), 160.9(d, C-2), 164.8(s, $\underline{C}$=0), 165.6(s, C-9a) MS 257($M^{\cdot +}$)
2c:	IR 3443, 3276, 3025, 1645 ^1H NMR(in DMSO-d_6, 100MHz) 7.0-7.3(2H, m, H-5,7), 7.20(1H, s, H-9), 7.47(1H, dm, J=8.8Hz, H-6), 8.08(1H, dm, J=8.8Hz, H-4 or 8), 8.17(1H, dm, J=9.0Hz, H-8 or 4), 8.24(2H, bs, $N\underline{H}_2$) MS 200($M^{\cdot +}$)
2d:	IR 3470, 3283, 3225, 3000, 1679, 1602 ^1H NMR(DMSO-d_6, 100MHz) 1.36(3H, t, J=7.5Hz, $COOCH_2C\underline{H}_3$), 4.38(2H, q, J=7.5Hz, $COOC\underline{H}_2CH_3$), 7.2-7.7(3H, m, H-5,6,7), 8.18(1H, dm, J=9.0Hz, H-4), 8.65(2H, bs, $N\underline{H}_2$), 9.29(1H, dm, J=8.9Hz, H-8) MS 272($M^{\cdot +}$)

This work was supported by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japanese Government (No. 00547021).

References

1) a) T. Morita, T. Nakadate, and K. Takase, Heterocycles, 15, 835(1981) and references cited therein.; b) K. Yamane, K. Fujimori, and T. Takeuchi, Bull. Chem. Soc. Jpn., 54, 2537(1981).

2) 2-Aminoazuleno[2,1-d]thiazole has been also prepared by A. Sato, A. Sato Doctral Thesis, Tohoku University, Sendai, March, 1962.

3) I. A. Ismail, D. E. Sharp, and M. R. Chedekel, J. Org. Chem., 45, 2243(1980).

4) All new compounds described in this paper gave satisfactory elemental analytical data.

(Received March 2, 1982)