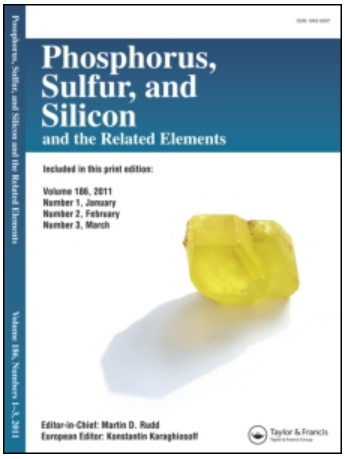

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Stereoselective Synthesis of Alkyl Z-2-(2-Amino-4-oxo-1,3-thiazol-5(4H)-yliden)Acetates in Solventless Conditions

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Stereoselective Synthesis of Alkyl *Z*-2-(2-Amino-4-oxo-1,3-thiazol-5(4*H*)-yliden)Acetates in Solventless Conditions

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Tiourea reacts with dialkyl acetylenedicarboxylates in solventless conditions to form 1:1 adducts, which undergo a cyclization reaction to produce alkyl Z*-2-(2-amino-4-oxo-1,3-thiazol-5(4*H*)-yliden)acetates in fairly good yields. The stereochemistry of the ethyl* Z*-2-(2-amino-4-oxo-1,3-thiazol-5(4*H*)-yliden)acetate was established by the use of X-ray single crystal structure analysis. The reaction is completely stereoselective.*

Keywords 1,3-Thiazol; acetylenic ester; Michael addition; stereoselectivity; thiourea; X-ray single crystal structure analysis

INTRODUCTION

Thiazole derivatives have attracted a great deal of interest owing to their antibacterial, antifungal, antiinflammatory, and antiviral activities.[1] They also are useful as antiallergic and anthelmintic agents and as sedative hypnotics.[1] In addition to being used in the pharmaceutical industry,[1–3] thiazoles also are widely used in the dye and

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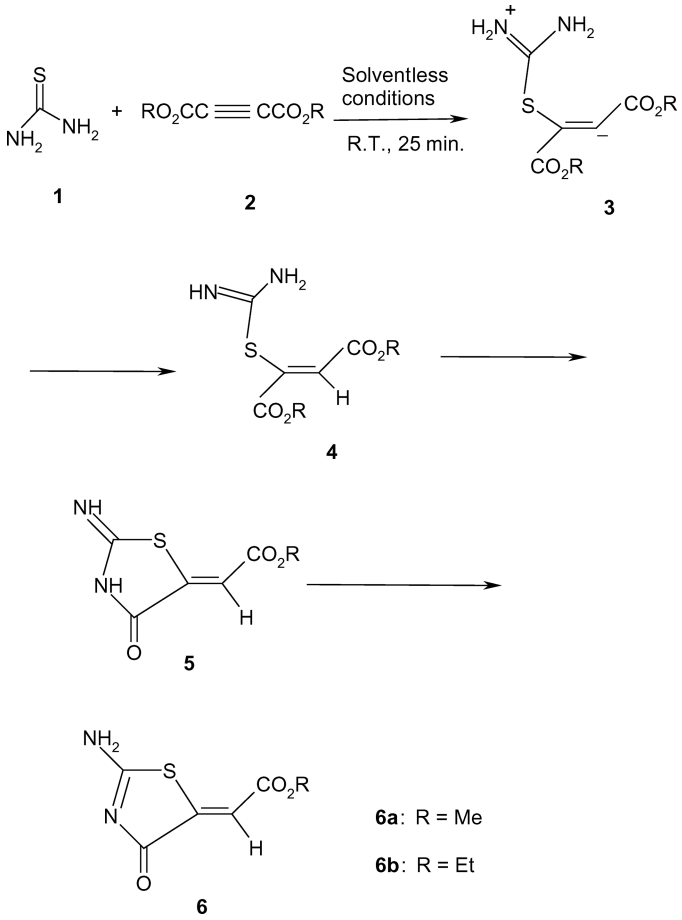
photographic industry.[1] Owing to these characteristics and our interest in the synthesis of heterocycles,[4,5] we were prompted to synthesize 2-aminothiazole (1,3-thiazol-2-amino) compound (**6**) from dialkyl acetylenedicarboxylate (**2**) thiourea (**1**) in solventless conditions (Scheme 1).



SCHEME 1

RESULTS AND DISCUSSION

The compound (**6**) may result from an initial Michael addition reaction of thiourea **1** to the acetylenic ester **2** and concomitant intramolecular protontransfer of the 1:1 adduct **3**, followed by an attack of the

imine nitrogen on the carbonyl group of the ester to form intermediate **5** (Scheme 1). Intramolecular proton transfer of the intermediate **5** leads to the formation of the alkyl *Z*-2-(2-amino-4-oxo-1,3-thiazol-5(4*H*)-yliden)acetates (**6**) in fairly good yields. TLC indicated that the reaction was completed in solventless conditions at room temperature after 25 min. The reaction proceeded smoothly and cleanly under the reaction conditions. The structures of **6a–b** were deduced from their IR, ^{1}H NMR, ^{13}C NMR, and MS spectra and elemental analysis. Stereochemistry of the ethyl *Z*-2-(2-amino-4-oxo-1,3-thiazol-5(4*H*)-yliden)acetate (**6b**) was established by the use of X-ray single crystal structure analysis.[6] The reaction is completely stereoselective.

In summary, we have developed a new and efficient, one-step stereoselective method for the preparation of compounds **6a–b** in solventless conditions at room temperature. Other aspects of this process are under investigation (Scheme 1).

EXPERIMENTAL

Melting points were measured on an Electrothermal 9100 apparatus and are uncorrected. Elemental analyses were performed using a Heraeus CHN-O-Rapid analyzer. IR spectra were recorded on a Shimadzu IR-460 spectrometer. ^{1}H and ^{13}C NMR spectra were measured with BRUKER DRX-500 AVANCE spectrometer at 500 and 125 MHz, respectively. Mass spectra were recorded on a Finnigan-Matt 8430 mass spectrometer operating at an ionization potential of 70 eV.

General Procedure for the Preparation of Alkyl *Z*-2-(2-Amino-4-oxo-1,3-thiazol-5(4*H*)-yliden)Acetates (6a–b)

Thiourea **1** (1 mmol) and acetylenic ester **2** (1 mmol) were ground at room temperature for 25 min. The mixture then was washed with cold acetone (3 mL) and white powders of **6** were collected by filtration.

Selected Data for Methyl Z-2-(2-Amino-4-oxo-1,3-thiazol-5(4H)-yliden)Acetate (6a)

White crystals, m.p. 232.0–233.0°C (dec.), yield 58.3%. IR (KBr) (υ_{max}, cm^{-1}): 3315; 1710; 1679. ^{1}H NMR (DMSO-d_6) δ_H: 3.83 (3H, s, CH_3); 6.62 (1H, s, =CH); 9.31 (1H, s, NH); 9.5–9.7 (1H, br. s, NH).^{13}C NMR (DMSO-d_6) δ_C: 50.82 (CH_3), 113.45 (=CH); 147.06 (=CS); 164.95 (C=N); 176.29 and 177.24 (2 C=O). MS (m/z, %): 187 (MH^+, 29); 186(M^+, 67); 144(100); 116(95); 85(100); 57(100). Analysis: Calc. for $C_6H_6N_2O_3S$(186.19): C, 38.71; H, 3.25; N, 15.05%. Found: C, 38.7; H, 3.2; N, 15.1%.

Selected Data for Ethyl Z-2-(2-Amino-4-oxo-1,3-thiazol-5(4H)-yliden)Acetate (6b)

White crystals, m.p. 239.0–240.0°C (dec.), yield 55.1%. IR (KBr) (υ_{max}, cm^{-1}): 3347; 3219; 1715; 1675; 1642. ^1H NMR (DMSO-d_6) δ_H: 1.24 (3H, t, $^3J_{HH}$ = 7.1 Hz, CH_3); 4.21 (2H, q, $^3J_{HH}$ = 7.1 Hz, OCH_2); 6.60 (1H, s, =CH); 9.4–9.7 (2H, br. s, NH_2).^{13}C NMR (DMSO-d_6) δ_C: 14.52 (CH_3), 61.82 (OCH_2), 115.55 (=CH); 148.53 (=CS); 166.30 (C=N); 177.99 and 179.09 (2 C=O). MS (m/z, %): 201 (MH^+, 25); 200(M^+, 61); 172(10); 158(100); 130(90); 128(8); 86(10); 85(96); 58(7); 57(98). Analysis: Calc. for $C_7H_8N_2O_3S$(200.22): C, 41.99; H, 4.03; N, 13.99%. Found: C, 41.8; H, 4.1; N, 14.2%.

REFERENCES

[1] M. M. V. Ramana, D. S. Dubhashi, and J. J. D'Souza, *J. Chem. Research (S)*, 496 (1998) and references cited therein.

[2] S. D. Larsen, C. F. Stachew, P. M. Clare, J. W. Cubbage, and K. L. Leach, *Bioorg. Med. Chem. Lett.,* **13,** 3491 (2003) and references cited therein.

[3] A. Gebert1, A. Linden, G. Mloston, and H. Heimgartner, *Polish J. Chem*., **77,** 867 (2003) and references cited therein.

[4] A. Ramazani, L. Yousefi, E. Ahmadi, and A. Souldozi, *Phosphorus, Sulfur, and Silicon,* **179,** 1459 (2004) and references cited therein.

[5] A. Ramazani and S. A. Hossaini-Alemi, *Phosphorus Sulfur, and Silicon,* **176,** 237 (2001).

[6] A. Ramazani, A. Morsali, A. A. Soudi, A. Souldozi, Z. A. Strarikova, and A. Yanovsky, *Z. Kristallogr., NCS,* **218,** 33 (2003)