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Note

Synthesis of *N*-[1-acetyl-5-(D-*arabino*-tetraacetoxybutyl)-2-methyl-3-pyrroyl]-*N*-phthalimidoacetamide

Mohamed M. El Sadek* and Nagwa N. El Soccary
Chemistry Department, Faculty of Science, Alexandria University, Alexandria (Egypt)

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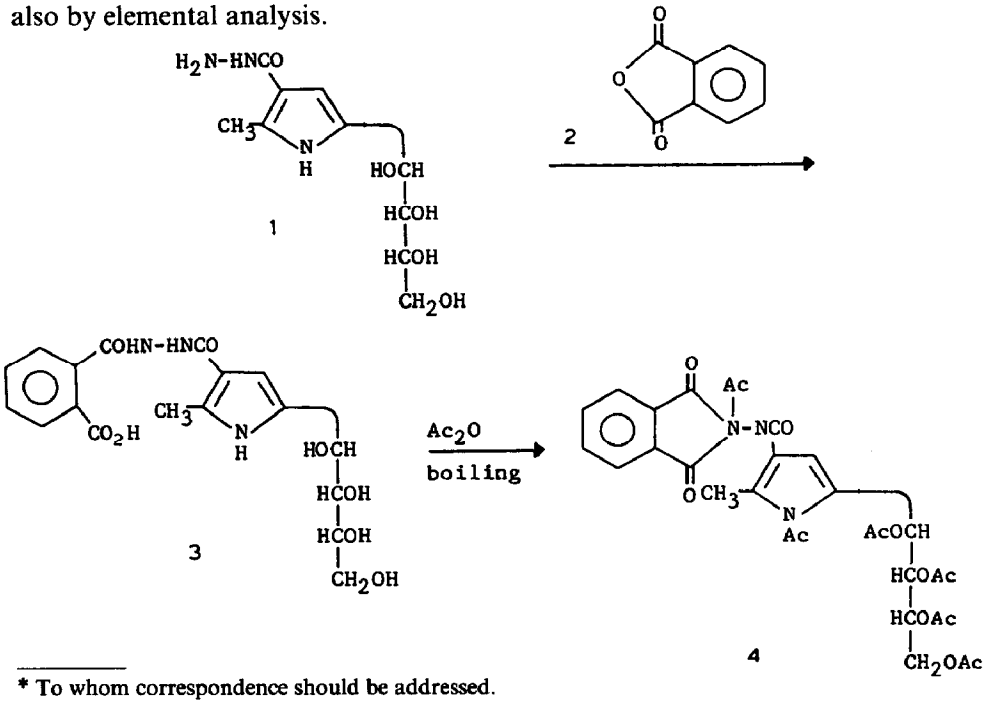
Continuing our work on the synthesis of nitrogen heterocycles from saccharide derivatives[1–5], 5-(D-*arabino*-tetrahydroxybutyl)-2-methyl-3-pyrroylhydrazine (**1**) was treated with phthalic anhydride[6–8] (**2**) to give *N*-[5-(D-*arabino*-tetrahydroxybutyl)-2-methyl-3-pyrroyl]-*o*-carboxybenzoylhydrazine (**4**) in 85% yield; its i.r. spectrum showed C=O, CO_2H, and NH and OH bands. Boiling this compound with acetic anhydride for 1 h afforded *N*-[1-acetyl-2-methyl-3-pyrroyl-5-(D-*arabino*-tetraacetoxybutyl)]-*N*-phthalimidoacetamide (**4**).

The assigned structure of **4** was based on disappearance of the CO_2H, NH, and OH bands in the i.r. and appearance of the NAc and OAc bands, by its mass spectrum which showed the molecular-ion peak M^+ at *m/z* 641 and the base peak at m/z 162, and also by elemental analysis.



* To whom correspondence should be addressed.

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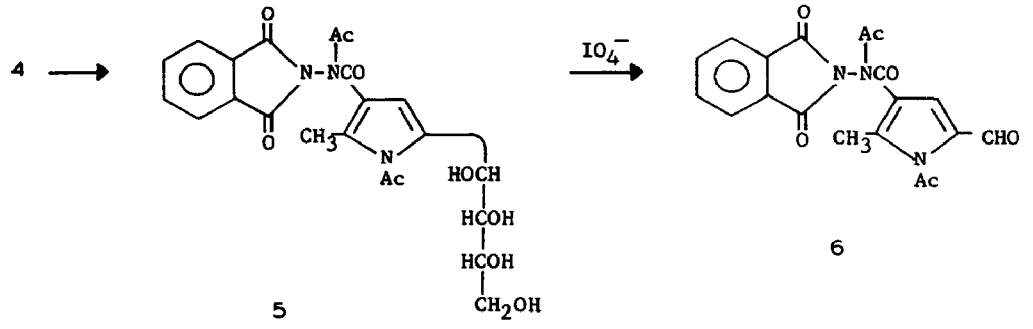
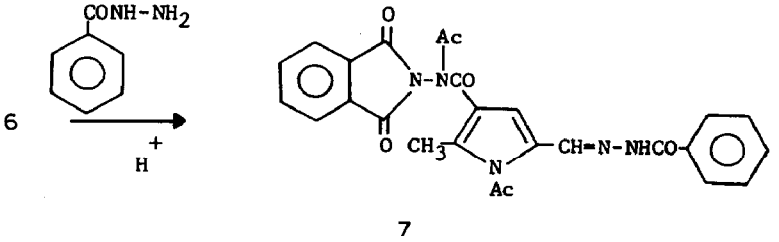
Deacetylation[9,10] of the *N*-phthalimido derivative **4** afforded an *O*-deacetylated derivative **5**, which showed disappearance of the OAc band in the i.r. and appearance of an OH band. Periodate oxidation of **5** afforded *N*-(acetyl-5-formyl-2-methyl-3-pyrroyl)-*N*-phthalimidoacetamide (**6**), whose ^{1}H-n.m.r. (Me_2SO-d_6) spectrum showed singlets at δ 1.9 (C–CH_3), 2.4, 2.5 (2 N–Ac), 6.75 (CH), and 9.3 (CHO), and a multiplet at 7.6–7.95 (Ar).



The reaction of aldehyde **6** with benzoylhydrazine in acidic medium gave *N*-[1-acetyl-5-(benzoylhydrazono)-5-formyl-2-methyl-3-pyrroyl]-*N*-phthalimidoacetamide (**7**), which showed C=N, N–Ac, C=O, and NH bands in the i.r.



EXPERIMENTAL

General methods. — Melting points were determined on a Kofler block and are uncorrected. I.r. spectra were recorded on Unicam SP 1025 spectrometer and n.m.r. spectra on a Varian EM-90 MHz spectrometer with Me_4Si as internal standard. T.l.c. was performed using silica gel G plates (0.25 cm). Microanalyses were performed at the Faculty of Science, Cairo University, Cairo, Egypt.

*N-[2-Methyl-3-pyrroyl-5-(*D-arabino-*tetrahydroxybutyl)]*-o-*carboxybenzoylhydrazine* (**3**). — A stirred solution of **1** (2 g, 7.7 mmol) in MeOH (50 mL) was treated with finely powdered phthalic anhydride (1.1 g, 7.7 mmol) added in portions at room temperature. After the addition was complete, the mixture was stirred at 50–60° until

t.l.c. (10:1 $CHCl_3$–MeOH) showed complete conversion to the *o*-carboxybenzoylhydrazine. The mixture was cooled, and the precipitated solid was filtered off, and dried; yield 2.7 g (85%). It was crystallized from EtOH; m.p. 158°. Found: C, 53.10; H, 5.13; N, 10.51%. $C_{18}H_{21}N_3O_8$ requires: C, 53.07; H, 5.16; N, 10.32%.

N-*[1-Acetyl-2-methyl-3-pyrroyl-5-(*D-arabino-*tetraacetoxybutyl)]*-N-*phthalimodoacetamide* (**4**). — A solution of **3** (2 g) in Ac_2O (30 mL) was boiled for 1 h to give **4**; yield 2.46 g (78%), which crystallized from EtOH; m.p. 97°. Found: C, 55.80; H, 4.89; N, 6.74%. $C_{30}H_{31}N_3O_{13}$ requires: C, 56.16; H, 4.84; N, 6.55%.

N-*[-Acetyl-2-methyl-3-pyrroyl -5-(*D-*arabino-tetrahydroxybutyl]*-N-*phthalimo doacetamide* (**5**). — A solution of **4** (1 g) in 3% NaOMe in MeOH (20 mL) was left overnight. Amberlite IR-120 (H^+) resin (10 g) was added and the product was filtered off and dried; yield 0.55 g (75%). It was crystallized from EtOH; m.p. 113°. Found: C, 56.01; H, 4.87; N, 8.52%. $C_{22}H_{23}N_3O_9$ requires: C, 55.81; H, 4.86; N, 8.88%.

N-*(1-Acetyl-5-formyl-2-methyl-3-pyrroyl)*-N-*phthalimidoacetamide* (**6**). — A solution of **5** (0.5 g, 1.1 mmol) in distilled water was treated with aq. $NaIO_4$ (6.8 g, 3.3 mmol) dropwise with stirring for 5. The aldehyde that separated out was filtered off and dried; yield 0.31 g (76%). It was crystallized from EtOH as needles, m.p. 101–104°. Found: C, 60.02; H, 4.03; N, 10.81%. $C_{19}H_{15}N_3O_6$ requires: C, 59.84; H, 3.94; N, 11.02%.

N-*[1-Acetyl-5-(benzoylhydrazono)-5-formy-2-methyl-3-pyrroyl]*-N-*phthalimidoacetamide* (**7**). — A solution of **6** (0.2 g, 0.53 mmol) in EtOH (10 mL) containing AcOH (0.01 mL) was treated with a solution of Bz_2NHNH_2 (70 mg, 0.53 mmol) in EtOH (5 mL). The mixture was boiled under reflux for 1 h and the benzoylhydrazone that separated was filtered off and dried; yield 0.21 g (81%). It was crystallized from 2:1 EtOH–C_6H_6; m.p. 178°. Found: C, 61.96; H, 4.48; N, 14.37%. $C_{26}H_{21}N_5O_6$ requires: C, 62.53; H, 4.21; N, 14.03%.

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