

SHORT COMMUNICATIONS

Synthesis of 4-Hydroxy-*N,N,N',N'*,4-pentamethyl-6-oxo-2-phenylcyclohexane-1,3-dicarboxamide

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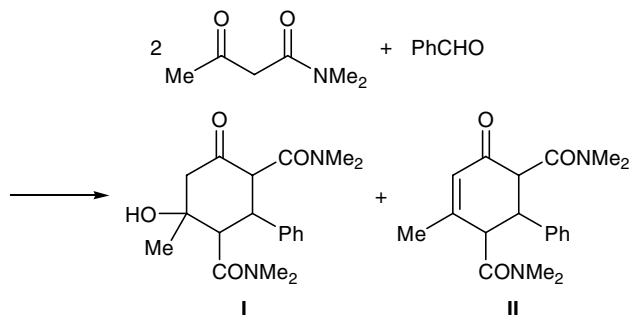
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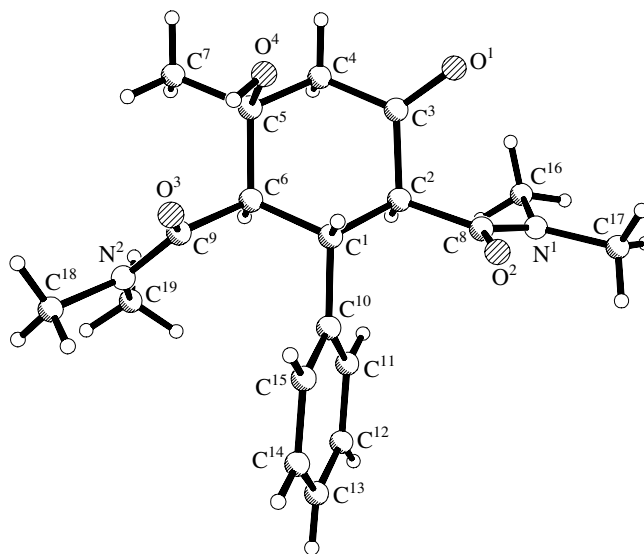
Acetoacetic acid esters are known to react with aromatic aldehydes in the presence of a base catalyst to give dialkyl 2-aryl-6-hydroxy-6-methyl-4-oxocyclohexane-1,3-dicarboxylates [1, 2]. Reactions of acetoacetamides with aromatic aldehydes under basic conditions were not reported. We performed the reaction of *N,N*-dimethylacetoacetamide with benzaldehyde in the presence of tetramethylguanidine in ethanol at room temperature and isolated 40% of 4-hydroxy-*N,N,N',N'*,4-pentamethyl-6-oxo-2-phenylcyclohexane-1,3-dicarboxamide (**I**).



Compound **I** is a colorless crystalline substance, which is soluble in common organic solvents and insoluble in water. The IR spectrum of a crystalline sample of **I** contained absorption bands at 1645 (C=O, ketone), 1720 (C=O, amide), and 3345 cm⁻¹ (O–H). In the ¹H NMR spectrum of **I** we observed a singlet at δ 1.10 ppm from protons of the 6-methyl group, a doublet at δ 5.36 ppm due to hydroxy proton, doublet signals at δ 2.27 and 3.68 ppm from protons in positions 1 and 3 of the cyclohexane ring, a triplet at

δ 3.80 ppm from 2-H, and two doublets of doublets at δ 2.88 and 4.56 ppm (AB system) belonging to the methylene protons on C⁵. The structure of compound **I** was unambiguously proved by X-ray analysis of a single crystal obtained by slow crystallization from ethanol (see figure).

Apart from compound **I**, we isolated a small amount of *N,N,N',N'*,4-pentamethyl-6-oxo-2-phenylcyclohex-4-en-1,3-dicarboxamide (**II**). Compound **II** is likely to be formed by dehydration of **I** due to catalytic effect of tetramethylguanidine.



Structure of the molecule of 4-hydroxy-*N,N,N',N'*,4-pentamethyl-6-oxo-2-phenylcyclohexane-1,3-dicarboxamide (**I**) according to the X-ray diffraction data.

4-Hydroxy-*N,N,N',N'*,4-pentamethyl-6-oxo-2-phenylcyclohexane-1,3-dicarboxamide (I). Tetramethylguanidine, 0.05 mol, was added to a solution of 0.1 mol of *N,N*-dimethylacetamide and 0.05 mol of benzaldehyde in 20 ml of ethanol, and the mixture was held for 24 h at room temperature. The precipitate was filtered off and recrystallized from ethanol. Yield 40%, mp 254–256°C. IR spectrum, ν , cm^{-1} : 3345 (OH), 1720 (C=O, amide), 1645 (C=O, ketone). ^1H NMR spectrum (DMSO- d_6), δ , ppm: 7.24 m (5H, C_6H_5), 5.36 d (1H, OH), 4.56 d.d (1H, 5-H, $J = 13.2$ Hz), 3.80 t (1H, 2-H), 3.68 d (1H, 3-H, $J = 12$ Hz), 2.88 d.d (1H, 5-H, $J = 13.2$ Hz), 2.81 s and 2.61 s [6H, 3-CON(CH_3) $_2$], 2.55 s and 2.48 s [6H, 1-CON(CH_3) $_2$], 2.27 d (1H, 1-H, $J = 12$ Hz), 1.10 s (3H, 6- CH_3).

Crystallographic data: $\text{C}_{19}\text{H}_{26}\text{N}_2\text{O}_4$; $a = 9.1740(18)$, $b = 20.334(4)$, $c = 10.394(2)$ Å; $\beta = 111.02(3)^\circ$; $V = 1809.9(6)$ Å 3 ; M 346.42; $d_{\text{calc}} = 1.271$ g/cm 3 ; $Z = 4$; space group $P2(1)/n$. A set of experimental reflections was acquired on a KM-4 automatic four-circle diffractometer (χ geometry; monochromatized MoK_α irradiation; $\omega/2\theta$ scanning, $2\theta \leq 50.14^\circ$). Total of 2747 independent reflections were measured ($R_{\text{int}} = 0.0192$) without correction for absorption ($\mu = 0.089$ mm $^{-1}$). The structure was solved by the direct method using SIR92 program [3], followed by calculations of the electron density maps. The hydroxy hydrogen atom was localized objectively from the difference synthesis

of electron density, and the positions of the other hydrogen atoms were set on the basis of geometry considerations. Full-matrix anisotropic refinement of the positions of non-hydrogen atoms by the least-square procedure (SHELXL-97 [4]) was complete at $R_1 = 0.0549$, $wR_2 = 0.1716$ [from 1875 reflections with $I \geq 2\sigma(I)$] and $R_1 = 0.0911$, $wR_2 = 0.1803$ (from all 2747 reflections).

The IR spectrum was recorded on a Specord M-80 spectrophotometer from a sample of **I** dispersed in mineral oil. The ^1H NMR spectrum was measured on a Varian Mercury-300 instrument (300 MHz) relative to tetramethylsilane as internal reference.

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