

SHORT  
COMMUNICATIONS

## 2-Nitroguanidine Derivatives. New Synthesis of 5(3)-Substituted 3(5)-Nitroamino-1,2,4-triazoles

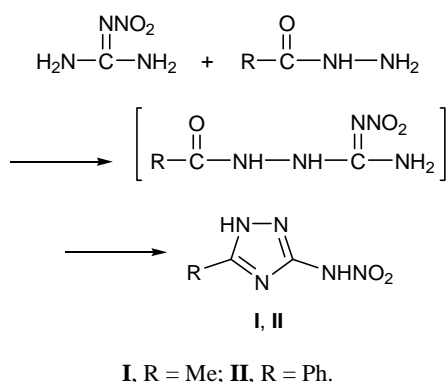
E. L. Metelkina and T. A. Novikova

St. Petersburg State Institute of Technology, Moskovskii pr. 26, St. Petersburg, 190013 Russia

Received June 28, 2003

We previously showed that 2-nitroguanidine reacts with alkyl- and phenylhydrazines to give 2-alkyl(or aryl)amino-2-nitroguanidine [1]. There are no published data on reactions of 2-nitroguanidine with carboxylic acid hydrazides. We anticipated that the lower basicity of carboxylic acid hydrazides, as compared to alkyl- and phenylhydrazines will favor their reaction with 2-nitroguanidine under conditions of base catalysis.

We have found that 2-nitroguanidine reacts with acetohydrazide and benzohydrazide at 75–78°C in the presence of an equimolar amount of potassium hydroxide; the subsequent acidification of the reaction mixture with hydrochloric acid yields 5(3)-substituted 3(5)-nitroamino-1,2,4-triazoles **I** and **II**. Presumably, the process involves intermediate formation of 1-acylamino-2-nitroguanidine which readily undergoes intramolecular cyclization to triazoles **I** and **II**. The properties of compounds **I** and **II** were consistent with those reported in [2, 3].



### 5(3)-Methyl-3(5)-nitroamino-1,2,4-triazole (**I**).

A solution of 4.48 g (0.08 mol) of potassium hydroxide in 30 ml of water was added with stirring to a suspension of 8.32 g (0.08 mol) of 2-nitroguanidine and 5.92 g (0.08 mol) of acetohydrazide in 50 ml of water. The mixture was heated for 3 h at 75–78°C, cooled to 18–20°C, and acidified with concentrated hydrochloric acid to pH 1–2. A finely crystalline solid precipitated and was filtered off, washed with cold water, and dried at 50–60°C. Yield 8.55 g (75%), decomposition point 208°C. UV spectrum,  $\lambda_{\text{max}}$ , nm (log  $\epsilon$ ): 291 (4.11). Found, %: C 25.96; H 3.34; N 49.12.  $\text{C}_3\text{H}_5\text{N}_5\text{O}_2$ . Calculated, %: C 25.87; H 3.49; N 48.95.

### 5(3)-Phenyl-3(5)-nitroamino-1,2,4-triazole (**II**)

was synthesized in a similar way from 4.16 g (0.04 mol) of 2-nitroguanidine and 4.88 g (0.04 mol) of benzohydrazide in 30 ml of water and 2.24 g (0.04 mol) of potassium hydroxide in 15 ml of water. Yield 5.5 g (75%), decomposition point 219°C (from aqueous methanol, 1:1). UV spectrum,  $\lambda_{\text{max}}$ , nm (log  $\epsilon$ ): 298 (4.19). Found, %: C 49.90; H 3.12; N 32.38.  $\text{C}_9\text{H}_7\text{N}_5\text{O}_2$ . Calculated, %: C 49.84; H 3.22; N 32.26.

The UV spectra were measured on an SF-9 spectrophotometer in water.

### REFERENCES

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2. Henry, R.A., *J. Am. Chem. Soc.*, 1950, vol. 72, p. 5343.
3. Chipen, G.I., Grinshtein, V.Ya., and Preiman, R.P., *Zh. Obshch. Khim.*, 1962, vol. 32, p. 454.