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Synthesis of symmetric and unsymmetric 1,1'-bis(1*H*-azol-1-yl)methanimines

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Abstract

A number of symmetric and unsymmetric 1,1'-bis(1*H*-azol-1-yl)methanimines (imidazole, 2-methylimidazole, 2-isopropylimidazole, 4(5)-methylimidazole and 1,2,4-triazole derivatives) was obtained for search for new activating and condensing agents in the synthesis of various classes of organic, natural compounds and their analogues. The general scheme for obtaining symmetrical and unsymmetric 1,1'-bis(1*H*-azolyl-1)methanimines was developed, respectively, on the basis of a single-step or two-step interaction of the starting azoles with cyanogen bromide in an aprotic solvent medium. In the first step, the reaction of imidazole, 2-methylimidazole, 4(5)-methylimidazole with cyanogen bromide in a molar ratio of 1 : 1 leads to the formation of the corresponding 1-cyano-1*H*-azoles. However, the reaction of 1,2,4-triazole with cyanogen bromide proceeds through the intermediate non-separable 1-cyano-1*H*-1,2,4-triazole formation, followed by the preparation of 1,1'-bis(1*H*-1,2,4-triazol-1-yl)methanimine due to the reduced basicity of 1,2,4-triazole in comparison with imidazoles. All azoles, when reacted with bromocyan in a 3 : 1 molar ratio, give symmetric 1,1'-bis(1*H*-azol-1-yl)methanimines in 83-90% yield. The preparation of unsymmetrical 1,1'-bis(1*H*-azol-1-yl)methanimines was carried out in two steps. At the first stage, the corresponding 1-cyano-1*H*-imidazole was synthesized from the starting imidazole and cyanogen bromide. In the second step, unsymmetrical 1,1'-bis(1*H*-azol-1-yl)methanimines were obtained in 76-82% yield by reacting the resulting 1-cyano-1*H*-imidazole with 2-methylimidazole, 4(5)-methylimidazole, 2-isopropylimidazole or 1,2,4-triazole. The structure of the synthesized 1,1'-bis(1*H*-azol-1-yl)methanimines was confirmed by IR and ^{1}H NMR spectroscopy, and uniformity by TLC. The new compounds may have a sufficiently high activity and stability in the aqueous and aqueous-organic media, which makes them promising activating and condensing agents in the synthesis of various groups of organic and natural substances.

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