Synthesis of (3-cyano-5,6,7,8-tetrahydroquinolin-2(1H)-ylidene)malononitriles

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Abstract

(3-Cyano-5,6,7,8-tetrahydroquinolin-2(1H)-ylidene)malononitriles were prepared for the first time by reaction the arylmethylidene malononitrile dimers with N-(1-cyclohexen-1-yl)morpholine.

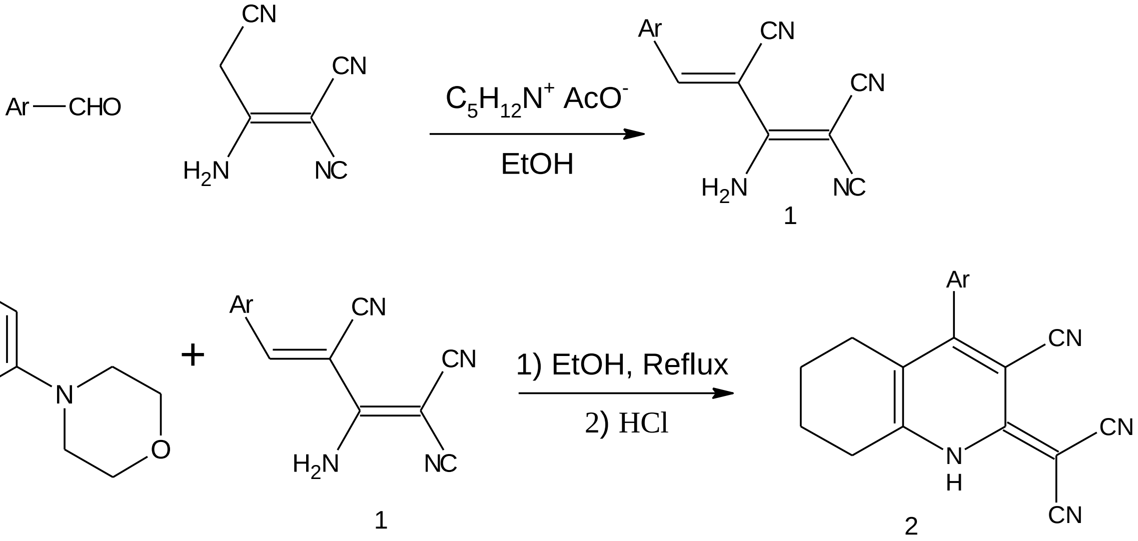
Keywords: arylmethylidene malononitrile dimer, enamime, dicyanomethylenes, quinolines.

Arylmethylidene derivatives of malononitrile dimer (AMDM) **1** are highly reactive Michael acceptors and are convenient and widely used synthetic reagents for constructing various heterocyclic systems [1]. The survey of literature reveals the methods for the preparation of (pyridin-2(1H)-ylidene)malononitriles and (isoquinolin-3 (2H)-ylidene)malononitriles [2,3]. However, there is no data on the preparation of quinolines by reaction of AMDMs with enamines. It is well known that quinoline derivatives have a wide spectrum of biological activity and therefore are of great interest for pharmaceutical chemistry.

The starting AMDMs **1** were prepared by reaction of malononitrile dimer with aromatic aldehydes under basic catalysis using piperidinium acetate. We succeeded to prepare (3-cyano-5,6,7,8-tetrahydroquinolin-2(1H)-ylidene) malononitriles **2** by condensation of AMDMs **1** with N-(1-cyclohexen-1-yl)morpholine under prolonged heating (Scheme 1). Compounds were obtained in the form of off white or yellow powders in 30-60% yields.

We suggest that AMDMs reacted with N- (1-cyclohexen-1-yl)morpholine to form Michael type adduct, followed by intramolecular cyclization through the attack of amino group at the position C-1 of the cyclohexene ring. The oxidation of partially saturated pyridine ring with air oxygen occurs during the reaction. Subsequent acidification with hydrochloric acid leads to the elimination of morpholine molecule and (3-cyano-5,6,7,8-tetrahydroquinolin-2(1H)-ylidene)malononitriles are formed (Scheme 2).

Scheme 1

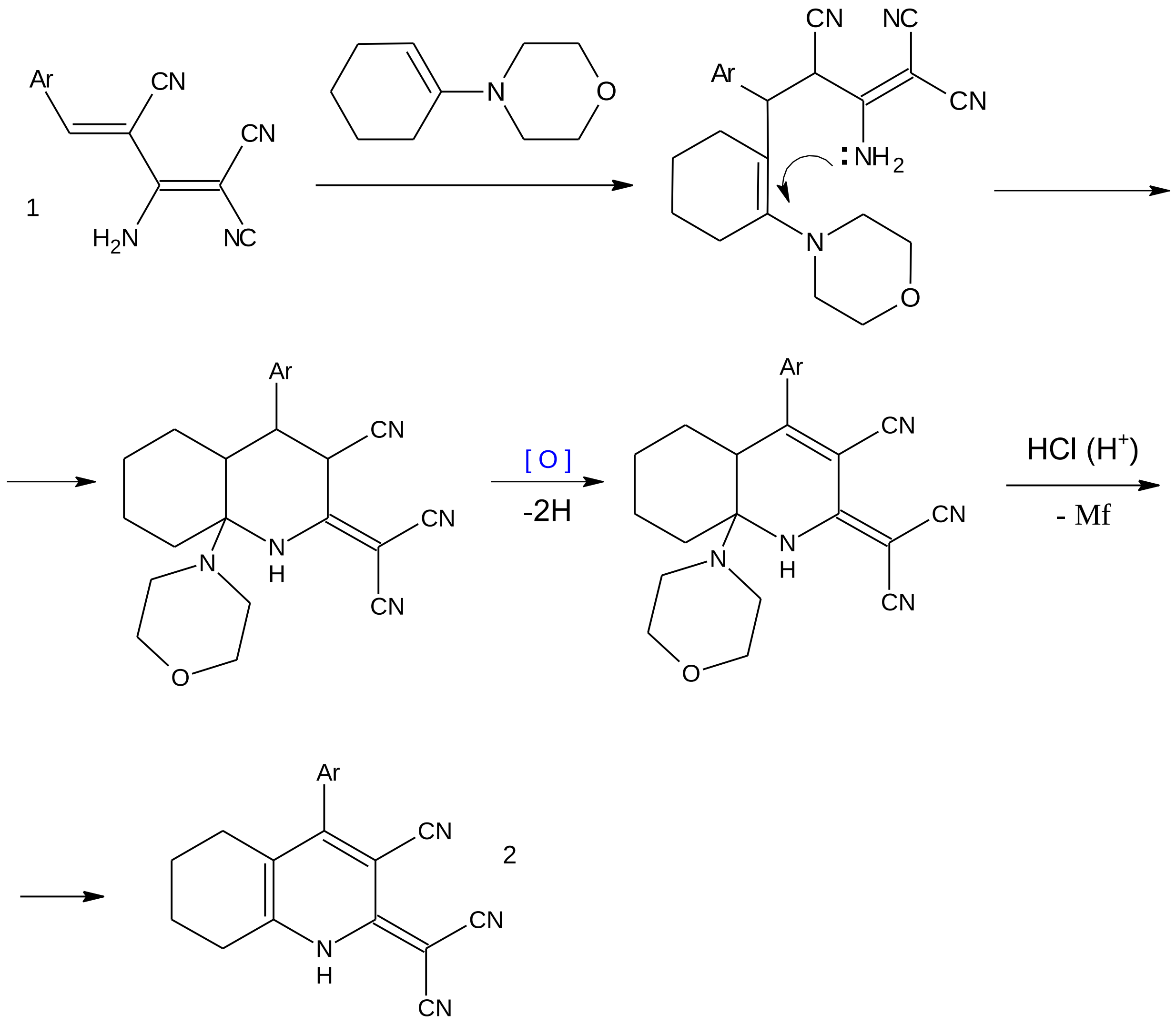


Ar = 4-BrC_6H_4; 3-thienyl; 4-$CH_3OC_6H_4$; 4-OH-3-$MeOC_6H_3$; 2,4-$Cl_2C_6H_3$.

Experimental

[4-Aryl-3-cyano-5,6,7,8-tetrahydroquinolin-2(1H)-ylidene]-malononitriles (2). 2-Amino-4-arylbuta-1,3-diene-1,1,3-tricarbonitrile (0.5 g) was dissolved in hot absolute EtOH (15 mL). To the solution formed, an excess (0.35-0.4 mL) of freshly distilled 4-(1-cyclohexen-1-yl)morpholine was added. A mixture was heated under reflux for 6-8 hours (TLC control). Then aq. HCl was added to adjust pH to 2. The solid product was filtered off and recrystallized from the appropriate solvents.

Scheme 2



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