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NOVEL ONE-POT SYNTHESIS OF 1H-1,5,7-TRIAZACYCLOPENTA[*c,d*]PHENALENES

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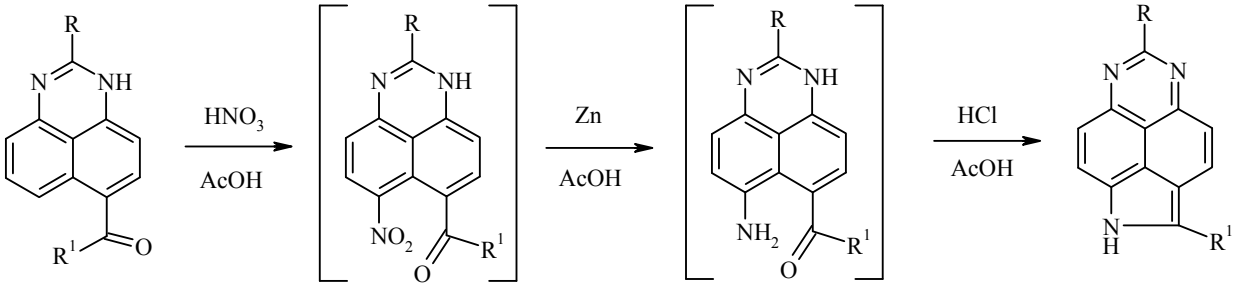
1H-1,5,7-Triazacyclpenta[*c,d*]phenalenes **4a-g** are of interest with respect to the search for biologically active compounds since they are structural analogs of known antitumor agents, e.g. AG 331 [1]. We have previously developed a series of methods for the synthesis of these compounds [2-4]. The drawback of these methods is the use of polyphosphoric acid (PPA) as solvent and hence the difficulty of working on a large scale. In this work we propose the removal of the drawback to this synthetic method based on a one pot reaction sequence for compounds **4a-g**, *viz.* nitration of the carbonyl compounds **1a-g**, reduction of the intermediate nitro compounds **2a-g**, and heterocyclization of the amines **3a-g**. The overall yields are 64-87%.



1a–g **2a–g** **3a–g** **4a–g**

^{1}H NMR spectra were recorded on a Bruker WP-200 instrument (200 MHz) with TMS as internal standard. Monitoring of the reaction course and purity of the synthesized compounds was carried out on Silufol UV-254 plates in the system ethyl acetate–alcohol (1:1).

Synthesis of Compounds 4a-g (General Method). A mixture of ketone **1a-g** (1 mmol), carbamide (0.03 g, 0.5 mmol), and nitric acid (d =1.4, 0.105 g, 1.05 mmol) in acetic acid (10 ml) was refluxed for 3 min. It was then treated with zinc powder (0.32 g, 5 mmol), refluxed for 1 h, conc. HCl (1 ml) was added, and then refluxed for a further 4 h (TLC monitoring). The reaction mixture was filtered and treated with water (50 ml). The precipitate formed was filtered off, the mother liquor was extracted with hot benzene (6×50 ml), and washed with a 10% solution of sodium carbonate (2×30 ml). Solvent was evaporated off and the residue was combined with the precipitate. The compound obtained was purified by crystallization.

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6-Methyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4a). Yield 0.132 g (64%); mp 237-238ºC (benzene) (mp 237-238ºC [3]). The ^{1}H NMR spectrum was similar to that reported in [3].

2-Methyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4b). Yield 0.131 g (73%); mp 259-260ºC (benzene) (mp 259-260ºC [2]). The ^{1}H NMR spectrum was similar to that reported in [2].

2,6-Dimethyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4c). Yield 0.179 g (81%); mp 271-272ºC (benzene) (mp 271-272ºC [2]). The ^{1}H NMR spectrum was similar to that reported in [2].

2-Methyl-6-phenyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4d). Yield 0.240 g (85%); mp 245-246ºC (benzene with petroleum ether) (mp 245-246ºC [3]). The ^{1}H NMR spectrum was similar to that reported in [3].

2-Phenyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4e). Yield 0.223 g (83%); mp 263-265ºC (benzene) (mp 263-265ºC [3]). The ^{1}H NMR spectrum was similar to that reported in [3].

6-Methyl-2-phenyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4f). Yield 0.243 g (86%); mp 291-292ºC (benzene) (mp 291-292ºC [3]). The ^{1}H NMR spectrum was similar to that reported in [3].

2,6-Diphenyl-1H-1,5,7-triazacyclopenta[*c,d*]phenalene (4g). Yield 0.300 g, (87%); mp 169-171ºC (benzene with petroleum ether) (mp 169-171ºC [3]). The ^{1}H NMR spectrum was similar to that reported in [3].

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