

SYNTHESIS OF ETHYL-6-CHLORO-2-METHYL-4-PHENYL- QUINOLINE-3-CARBOXYLATE USING DIFFERENT HETEROGENEOUS CATALYSTS IN DRY MEDIA UNDER MICROWAVE IR-RADIATION

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Received: May 22, 2018

Accepted: July 02, 2018

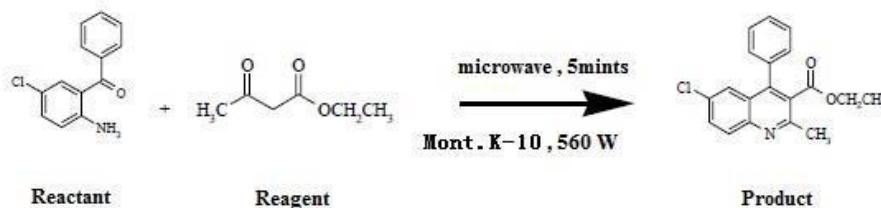
ABSTRACT

Ethyl-6-chloro-2-methyl-4-phenyl-quinoline-3-carboxylate is synthesized in dry media using heterogeneous catalyst in high yield in shorter reaction time under microwave ir-radiations.

Keywords: Indole, Microwave, Aryl, heterocyclic.

Introduction:

The trisubstituted quinolines have wide range of biological activities as anti-malarial, anti-bacterial, anti-asthmatic, anti-hypertensive, anti-inflammatory, anti-platelet activity and as tyro-kinase PDGF-RTK inhibiting activity.¹⁻³ The synthesis of trisubstituted quinolines under conventional refluxing conditions require longer reaction time and tedious work up so, there existed a need for alternative methods to carry out the synthesis of trisubstituted quinolines. Microwave assisted reactions are gaining much more importance in synthetic organic chemistry due to dramatic reduction in time from days to hours and hours to minutes or seconds.⁴⁻²⁴ The conventional heating reaction conditions are modified by changing media and catalyst. The present work reports the synthesis of Ethyl-6-chloro-2-methyl-4-phenyl-quinoline-3-carboxylate in dry media using heterogeneous catalyst in high yield in shorter reaction time under microwave irradiations (Scheme-I).



(Scheme)

We initiated our investigations by condensing ethylacetoacetate with 5-chloro-2-aminobenzophenone (1mmole) at 80 W, 160 W, 240 W, 320 W, 400 W, 480 W and 560 W in the presence of Mont.K-10. The results obtained are shown in Table-1 below. As can be seen from the Table-1 that when ethylacetoacetate (1mmole) react with 5-chloro-2-aminobenzophenone (1mmole) to give Ethyl-6-chloro-2-methyl-4-phenyl-quinoline- 3-carboxylate, 560 W power level proved to be the best from the yield point of view.

Table-1: Synthesis of Ethyl-6-chloro-2-methyl-4-phenyl-quinoline-3-carboxylate using Mont.K-10 under various ir-radiation (power levels).

Sr. No.	Power Levels (watts).	Yield (%).	Time (mints.)
1	80	82	5
2	160	86	5
3	240	89	5
4	320	91	5
5	400	94	5
6	480	96	5
7	560	98	5

We next carried out the formation of Ethyl-6-chloro-2-methyl-4-phenyl-quinoline-3-carboxylate by condensing ethylacetoacetate with 5-chloro-2-aminobenzophenone(1mmole) at 560W in the presence of Mont. KSF, silica gel, MgSO₄(anhyd), Na₂SO₄(anhyd), Yb(OTf)₃, Sc(OTf)₃, Dy(OTf)₃, Gd(OTf)₃, InCl₃,Y(OTf)₃ and Bi(OTf)₃ catalysts. The results obtained have also been collected in the Table 2.

Table-2: Synthesis of Ethyl-6-chloro-2-methyl-4-phenyl-quinoline-3-carboxylate using different catalysts at 560W under various ir-radiation

Sr. No.	Catalyst	Time (in min.)	Yield (%)
1	Mont. K-10	5	98
2	Mont. KSF	5	97
3	Silica gel	5	96
4	MgSO ₄ (anhyd)	5	95
5	Na ₂ SO ₄ (anhyd)	5	94
6	Yb(OTf) ₃	5	93
7	Sc(OTf) ₃	5	92
8	Dy(OTf) ₃	5	91
9	Gd(OTf) ₃	5	90
10	InCl ₃	5	89
11	Y(OTf) ₃	5	88
12	Bi(OTf) ₃	5	87

Experimental:

All the melting points reported are uncorrected. Infrared spectra (V_{max} in cm^{-1}) were recorded in nujol mull or KBr on a Perkin-Elmer 842/Beckman IR-20 / Hitachi 215 spectrometers. The proton magnetic resonance spectra were recorded on a VXR-200 MHz or R-32 Perkin-Elmer 90 MHz spectrometer in CDCl₃ or DMSO-d₆ using tetramethylsilane (TMS) as internal reference standard. The chemical shifts are expressed in δ (ppm) units downfield from TMS. Mass spectra were scanned on a Jeol JMX-DX-300 spectrometer operating at 70 eV. Carbon, hydrogen and nitrogen analyses were carried out on a Yanaco MT -3 (JAPAN) instrument. Thin layer chromatography (TLC) were performed on silica-gel plates using acetone-benzene (1 : 3 or 1 : 2) as solvent system and iodine chamber as visualizing agent.

Typical procedure for the synthesis of Ethyl-6-chloro-2-methyl-4-phenyl-quinoline- 3-carboxylate: A mixture of ethylacetacetate (1mmole), 5-chloro-2-aminobenzophenone (1mmole), catalyst (1g) was taken in an Erlenmeyer flask(100 ml) and was ir-radiated for 5 minutes at 70% power level (560 W) in an unmodified domestic microwave oven operating at 2450 MHz. After cooling to room temperature, the crude product was extracted and recrystallised with ethanol to yield pure Ethyl-6-chloro-2-methyl-4-phenyl -quinoline-3-carboxylate. Mp observed : 110°C, reported: 110°C : 1H - NMR (δ in ppm in CDCl₃): δ = 0.90 (t, J = 7 Hz, 3H), 2.75 (s, 3H), 3.95 (q, J=7 Hz, 2H), 7.25-7.35 (m, 2H), 7.4-7.5 (m, 4H), 7.6 (dd, J = 8 Hz, 1H), 7.95 (d, J=8 Hz, 1H) and IR (KBr, cm^{-1}) : 3066, 2989,1727, 1605, 1223, 906, 733.

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