Total Synthesis of the Chlorinated Pentacyclic Indole Alkaloid (+)-Ambiguine G

Lingbowei Hu, Viresh H. Rawal

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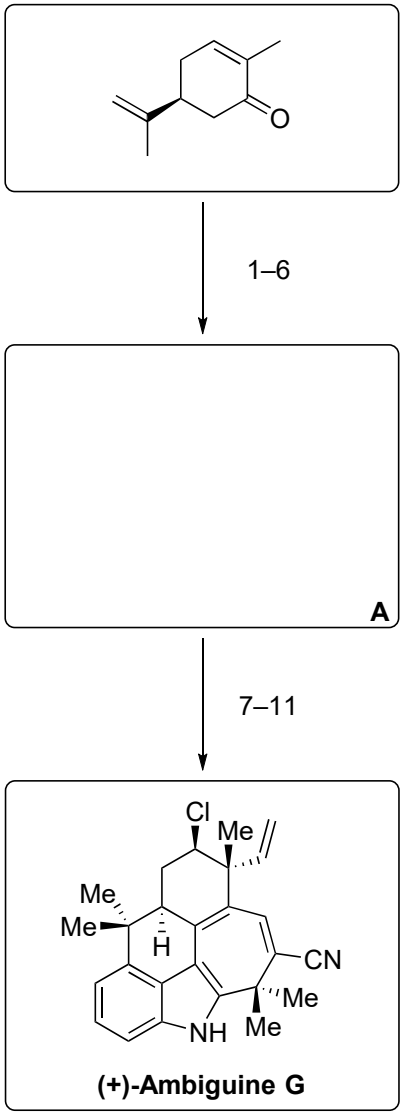
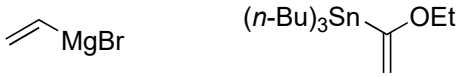
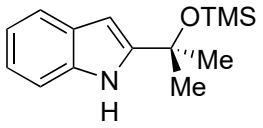


1) H_2O_2, NaOH
2) $TsNHNH_2$; **1**; $CuCl_2$
3) NCS, PPh_3
4) NaHMDS, Comins' reagent
5) **2**, $Pd(dppf)Cl_2$, CuI, LiCl
6) TMSOTf, **3**; HCl



1

2



3

7) BF_3•OEt_2, MeOH; TBAF, DDQ
8) DIBAL; Et_2AlCl; KHMDS, $P(OMe)_3$, air
9) NBS; PPTS
10) $Pd(dba)_2$, P(*t*-Bu)$_3$, $Zn(CN)_2$, Zn
11) BF_3•OEt_2, Et_3SiH

1) Name the starting material.
2) Propose a mechanism.
3) Name the reaction.
4) Give the structure of Comins' reagent.
5) Name the reaction.
6) Classify the reaction.

7) Name the reaction.
8) Give the role of $P(OMe)_3$.
9) Give the role of PPTS.
10) Provide the structure of dba.