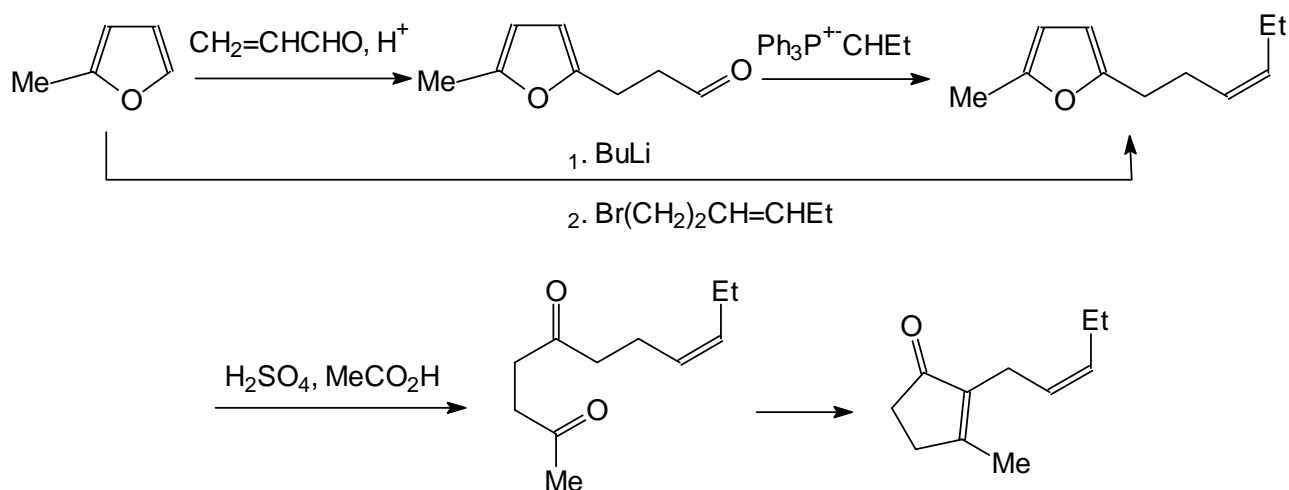
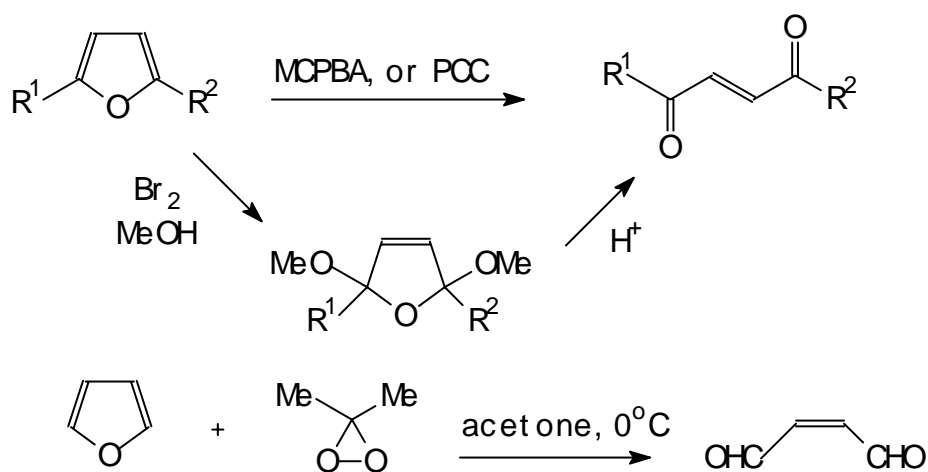


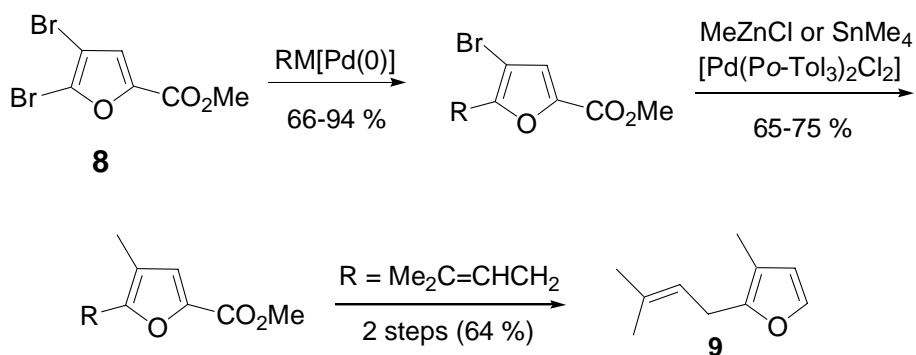
6.2.6 Ring-cleavage reactions



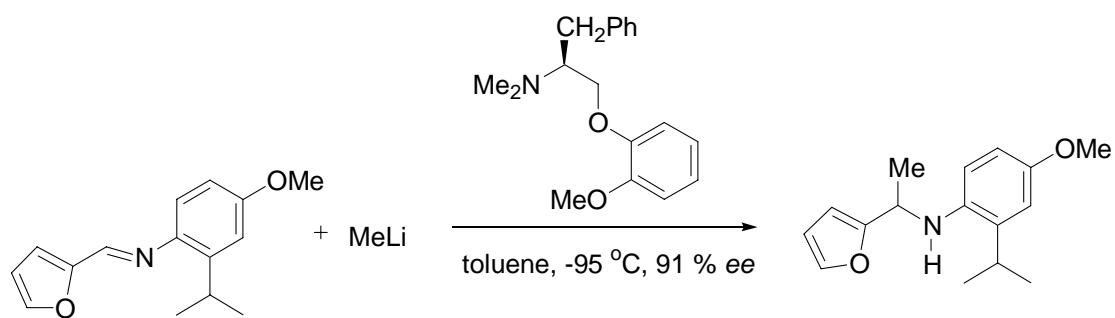
Synthesis of cis-jasmone from 2-methylfuran.



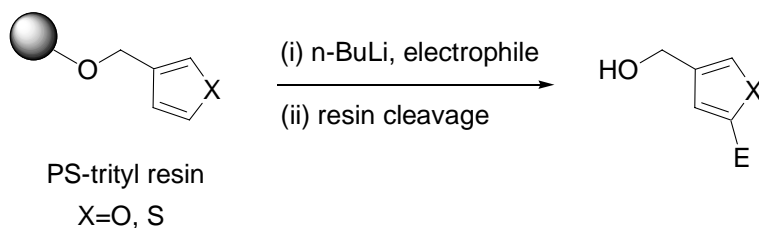
Oxidative cleavage of furans to enediones.



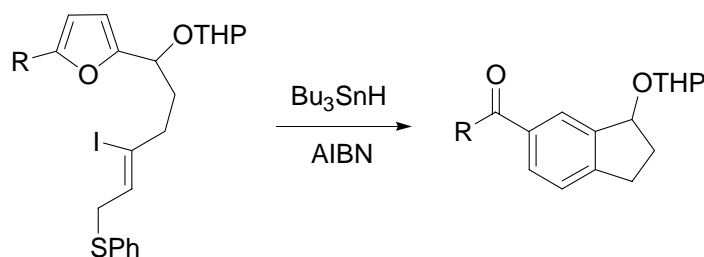
Synlett, 1998, 1185.



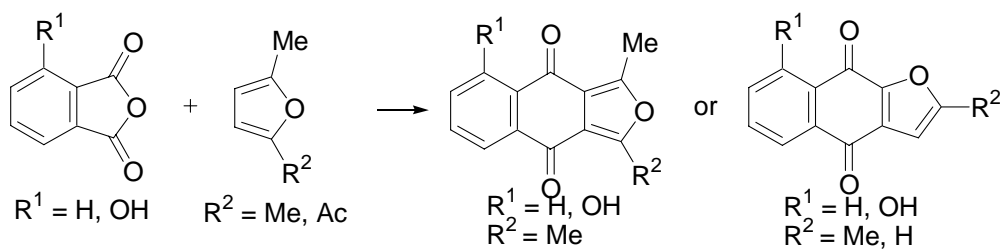
Heterocyclics, **1998**, (56) 165.



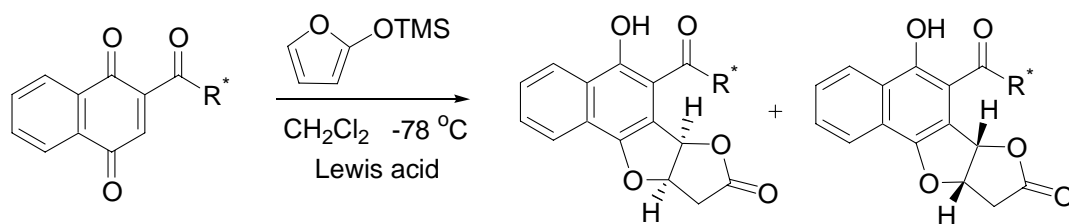
Synlett, **1998**, 405.



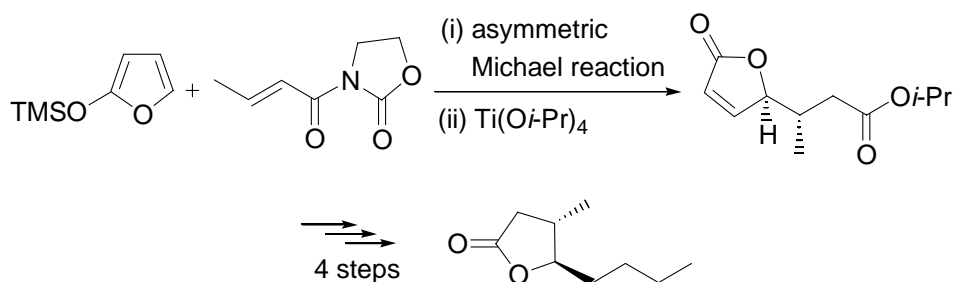
Synlett, **1998**, 1215.



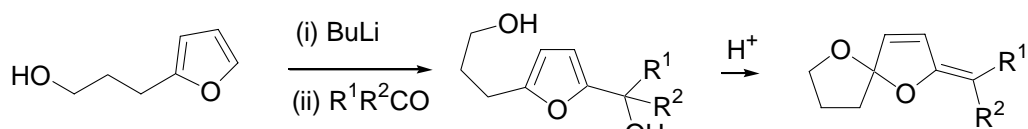
Heterocyclic **1998**, (48), 1631.



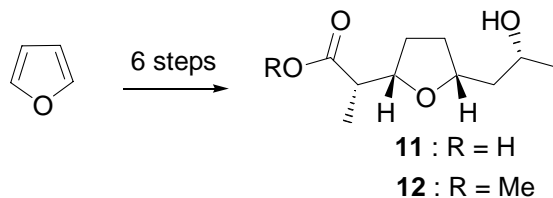
Tetrahedron. Asymmetry, **1998**, 1257.



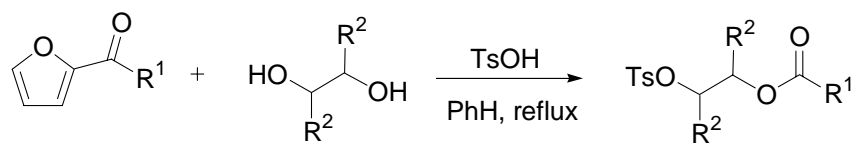
Tetrahedron. Asymmetry, **1998**, 1165.



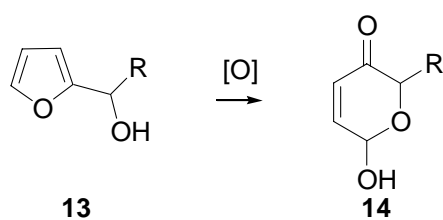
J. Org. Chem. **1998**, 5169.



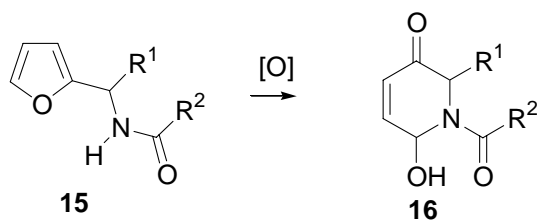
Eur. J. Org. Chem. **1998**, 2073.



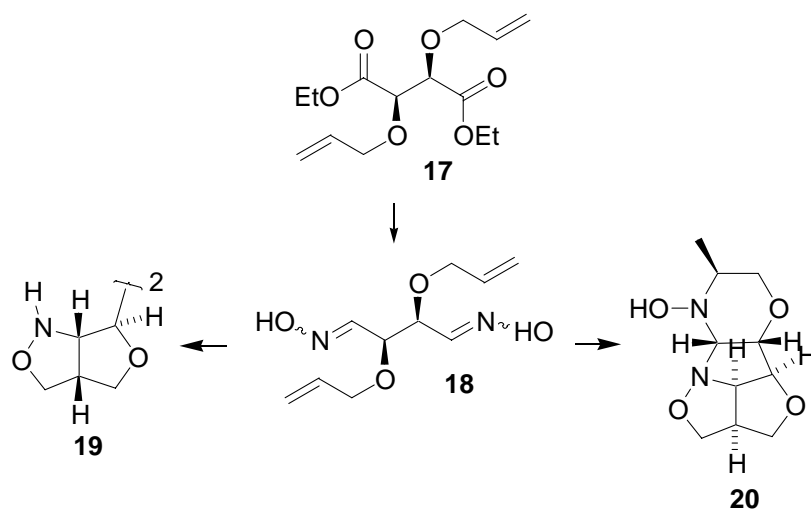
Tetrahedron Lett. **1998**, 2051.



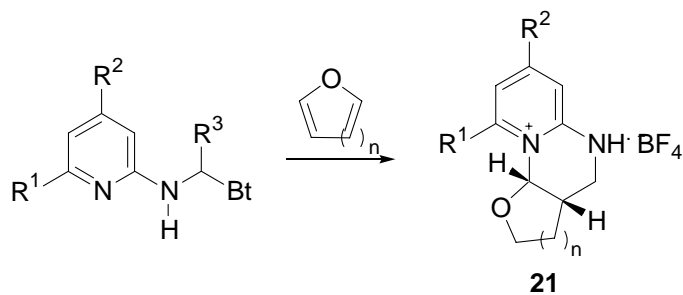
Heterocyclics, **1998**, (48) 129.



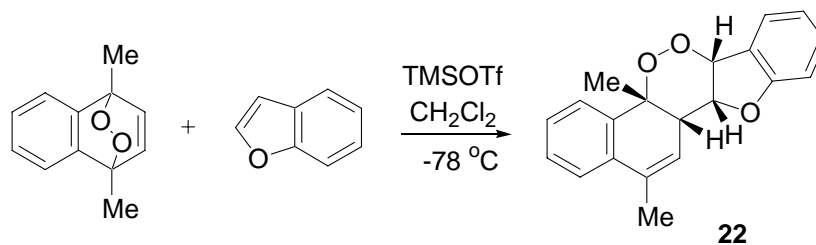
Synlett, **1998**, 105.



Synlett, 1998, 277.



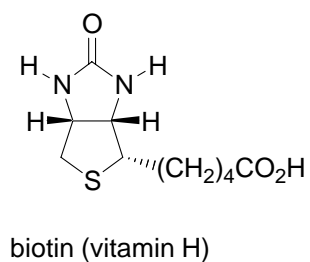
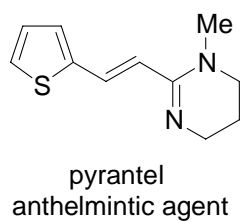
Synthesis, 1998, 704.

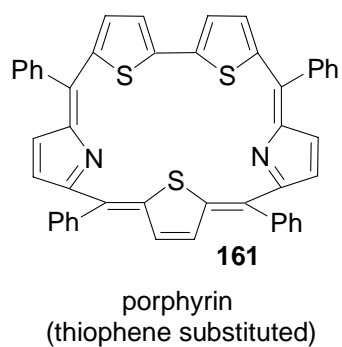
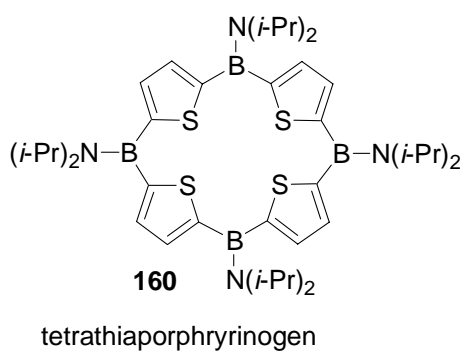
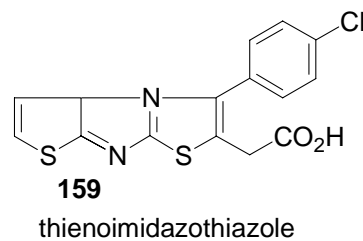
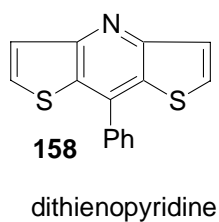
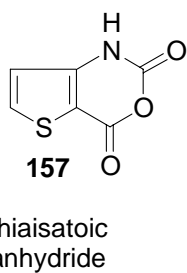
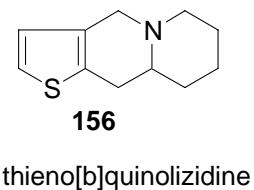
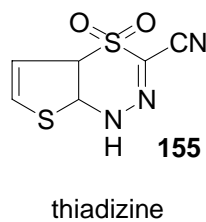
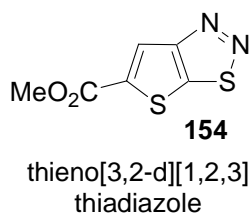
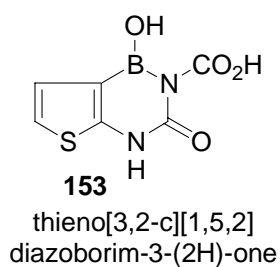
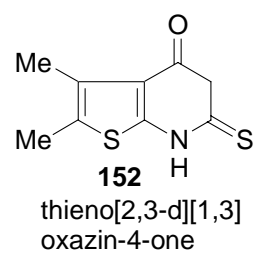
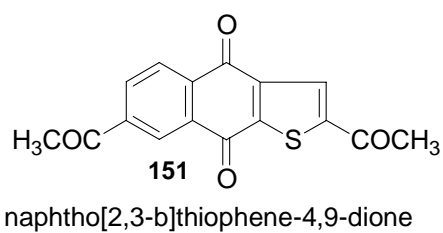
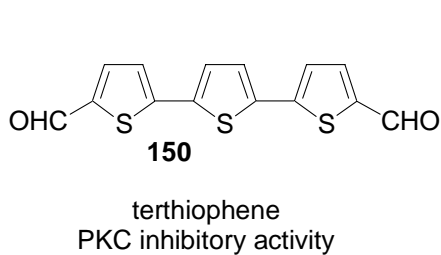
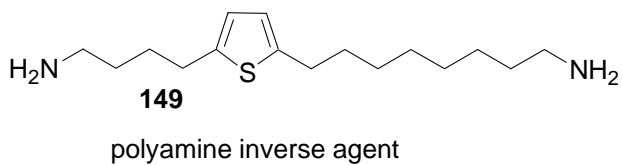
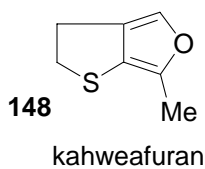


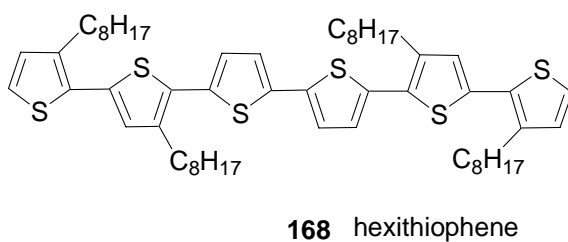
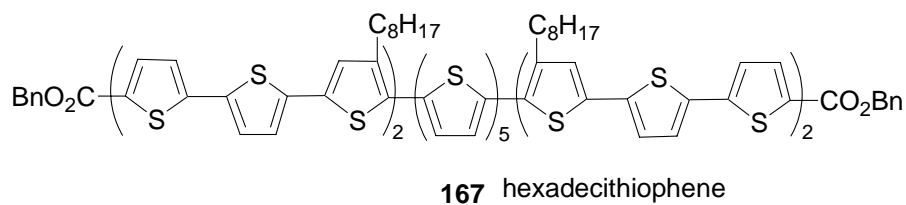
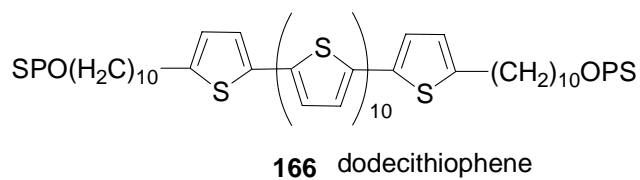
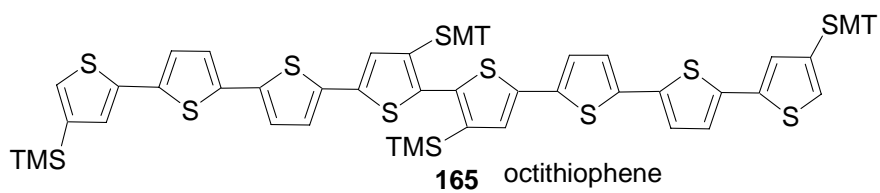
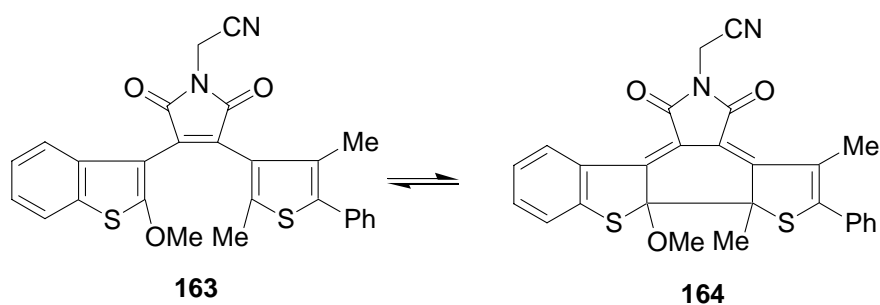
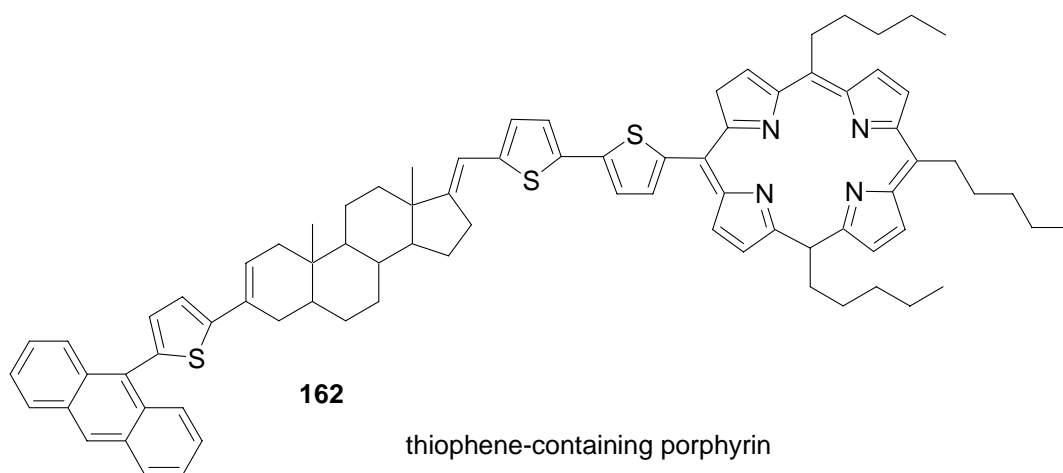
Heterocyclic, 1998, (47) 283.

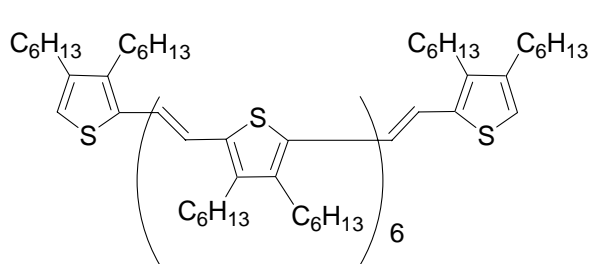
6.3 Thiophenes

6.3.1 Introduction

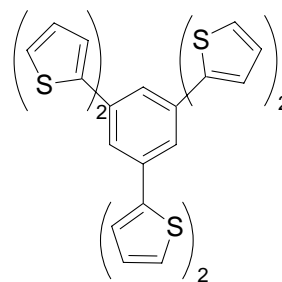




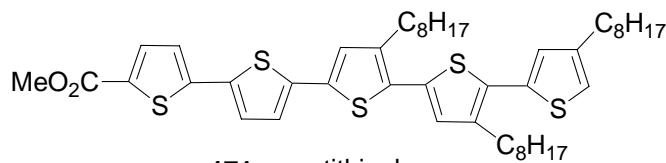




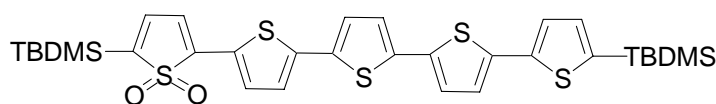
169 oligomeric vinylthiophene



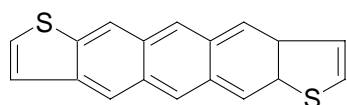
170 star-shaped hexithiophene



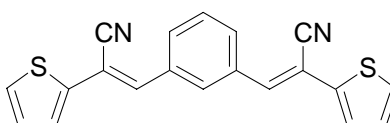
171 pentithiophene



172 quaterthiophene

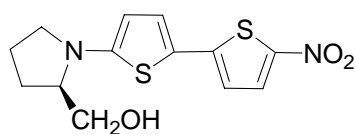


173 anthradithiophene

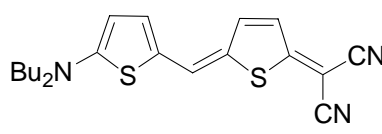


174 dithiophene

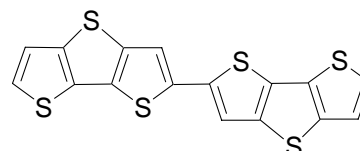
Conducting materials



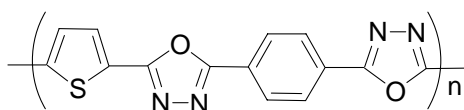
175



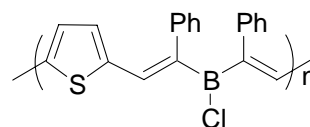
176



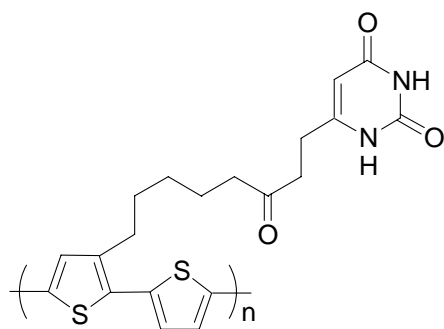
177



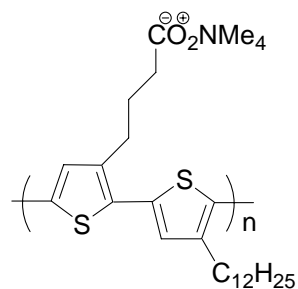
178



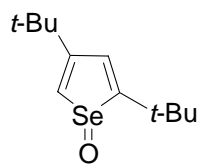
179



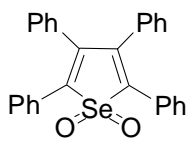
180



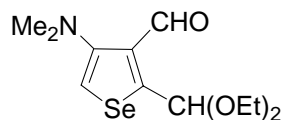
181



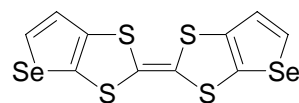
182



183

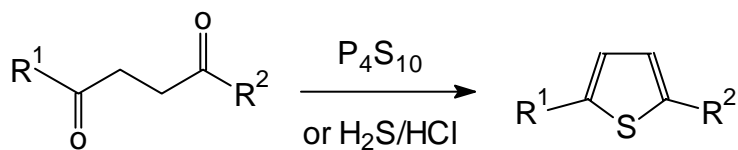


184

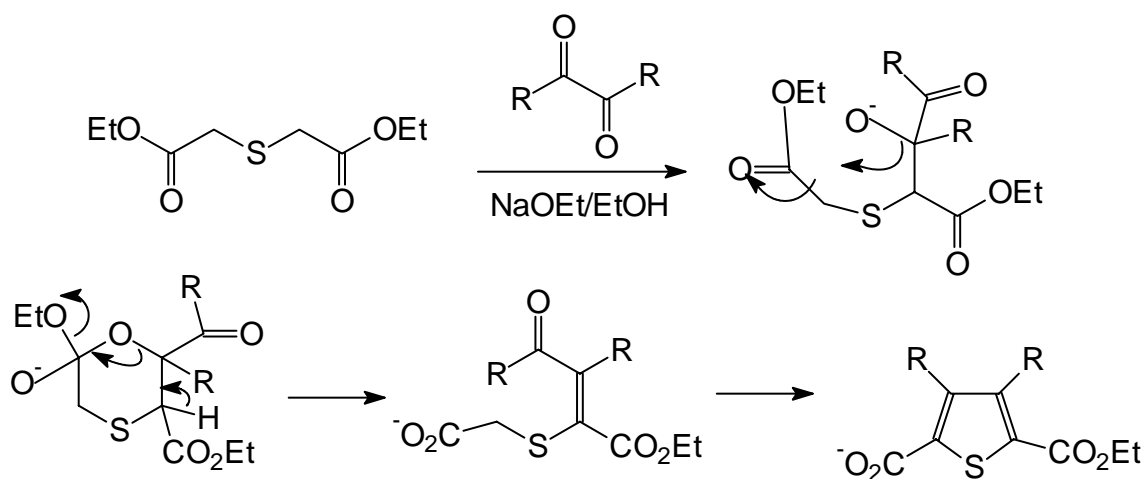


185

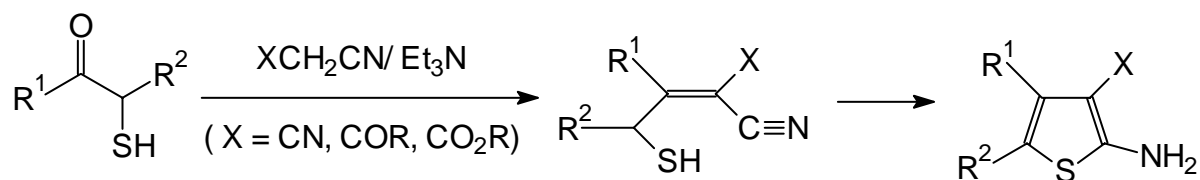
6.3.2 Ring synthesis



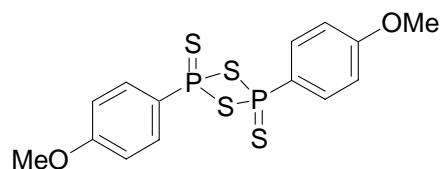
Paal synthesis



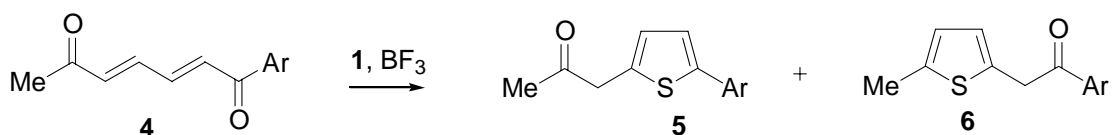
Hinsberg synthesis



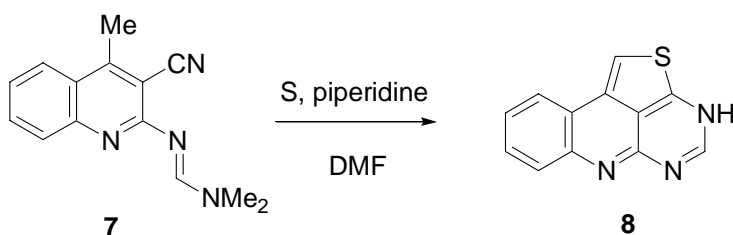
Gewald synthesis



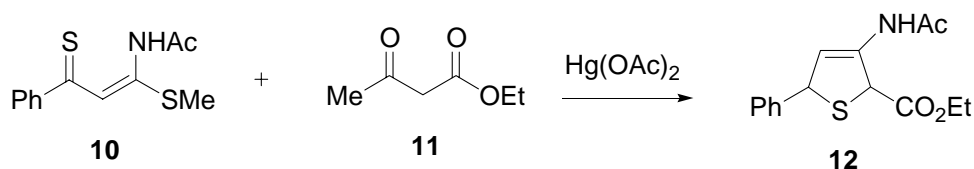
1 Lawesson's reagent



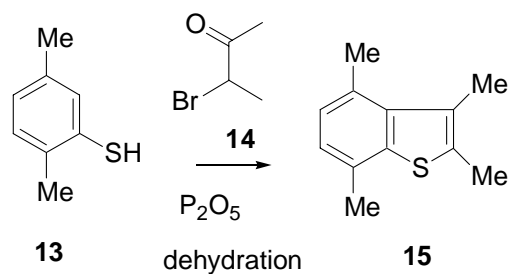
Tetrahedron lett. **1998**, 9191.



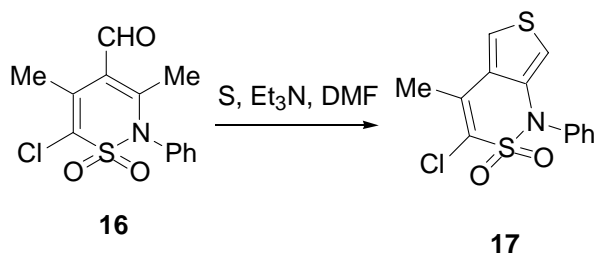
J. Chem. Res. Synop. **1998**, 294.



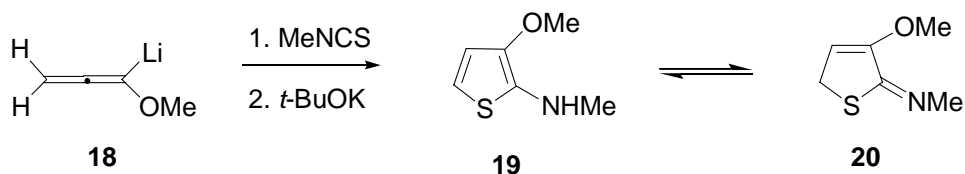
J. Org. Chem. **1998**, 5903.



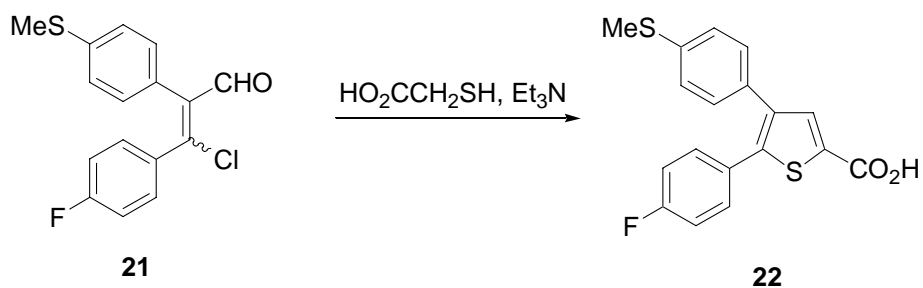
J. Chem. Res. Synop. **1998**, 172.



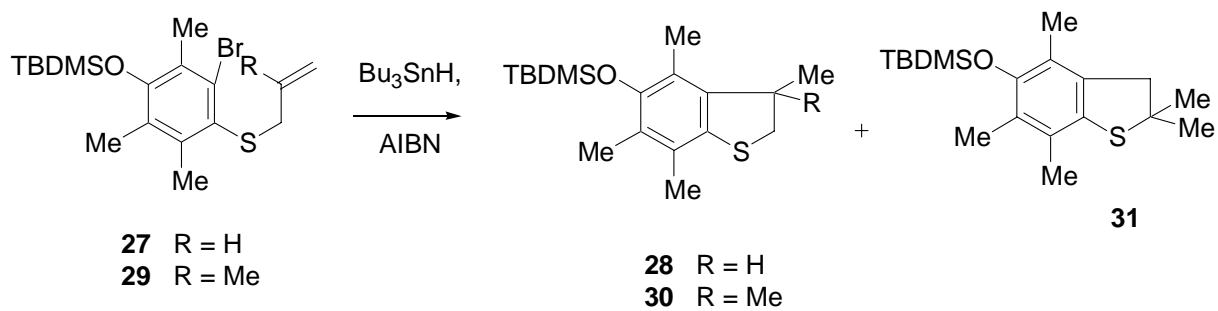
J. Heterocycles Chem. **1998**, 1449.



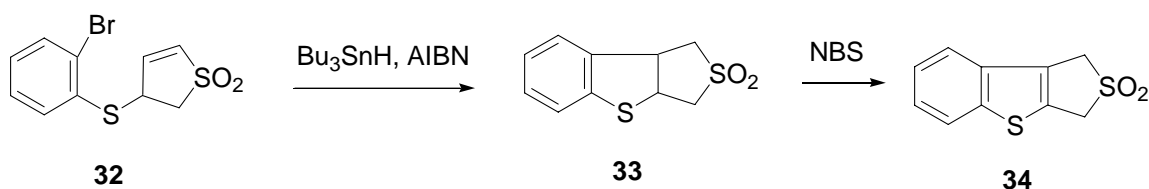
Eur. J. Org. Chem. **1998**, 253.



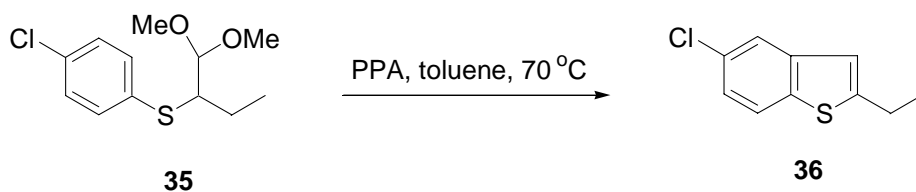
Chem. Pharm. Bull. **1998**, 279.



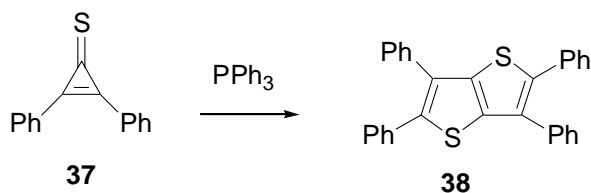
J. Org. Chem. **1998**, 3318.



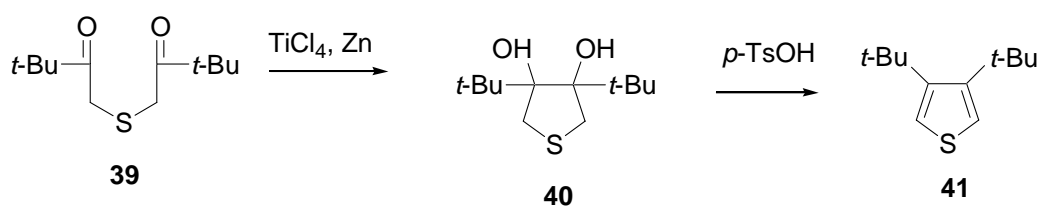
J. Org. Chem. **1998**, 4645.



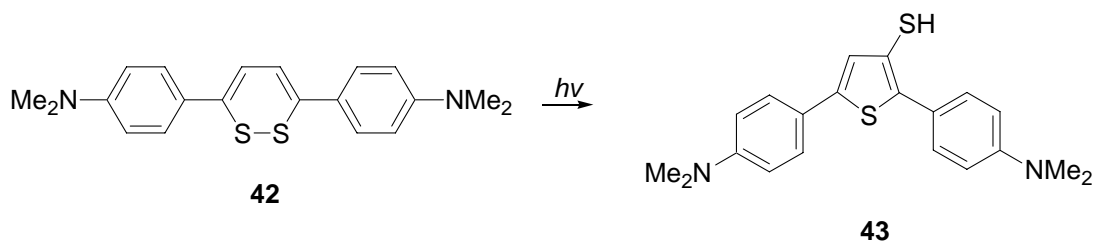
Syn. Commun. **1998**, 3479.



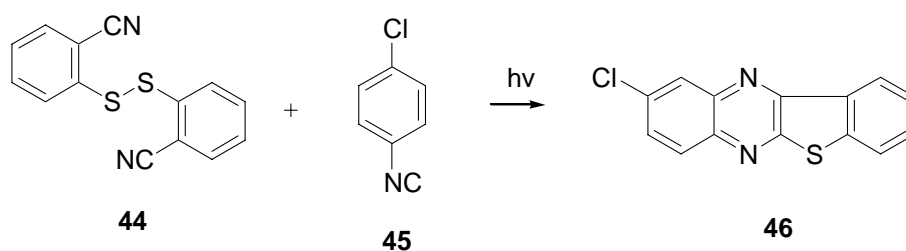
J. Org. Chem. **1998**, 163.



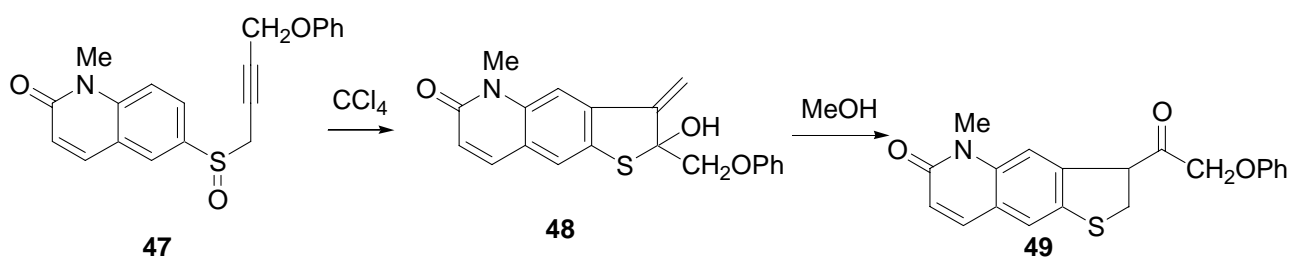
J. Org. Chem. **1998**, 4912.



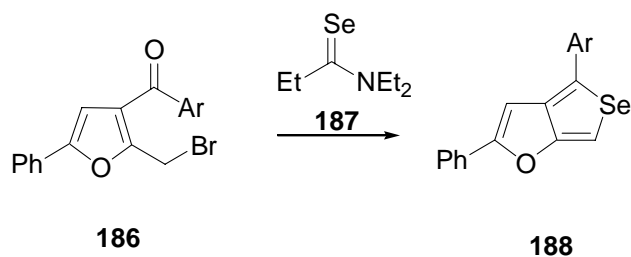
Eur. J. Org. Chem. **1998**, 2365.



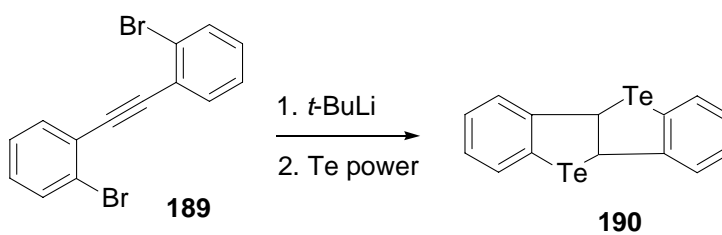
Tetrahedron, **1998**, 5587.



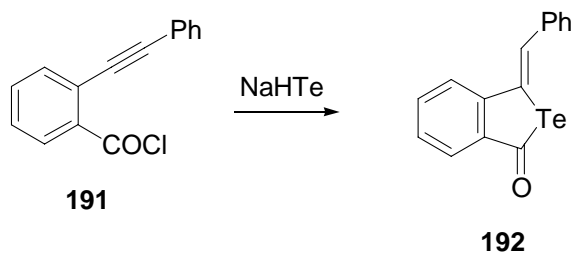
Tetrahedron, **1998**, 11603.



J. Heterocyclic Chem. **1998**, 71.



J. Heterocyclic Chem. **1998**, 725.

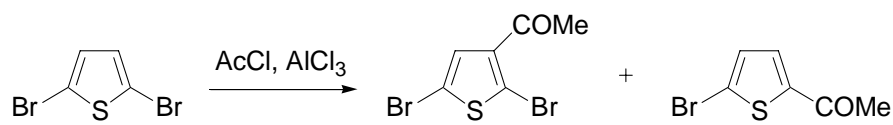


J. Heterocyclic Chem. **1998**, 165.

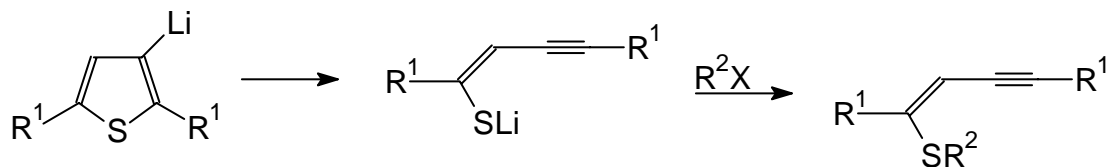
6.3.3 Electrophilic substitution

Table 6.2 Electrophilic substitution of thiophene.

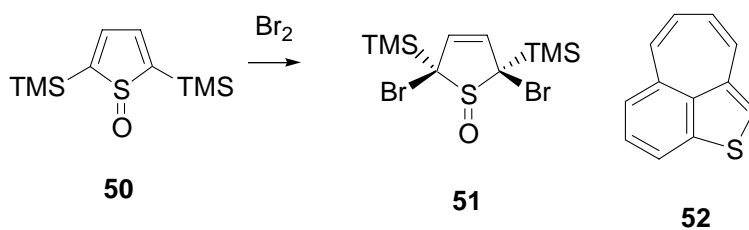
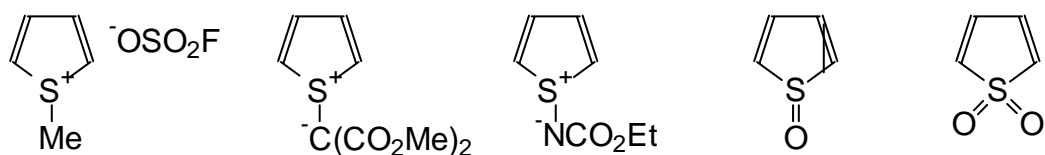
Substituents introduced	Reagents and conditions
NO ₂	HNO ₃ , (MeCO) ₂ O, -10°C
Cl	SO ₂ Cl ₂ , heat
Br	NBS, CHCl ₃ , MeCO ₂ H
CHO	Me ₂ NCHO, POCl ₃
COMe	MeCOCl, SnCl ₄
SO ₃ H	SO ₃ -pyridine
-CMe ₂ -	Me ₂ CO, 70% H ₂ SO ₄
CH ₂ NMe ₂	Me ₂ NCH ₂ ⁺ Cl ⁻ , MeCN, heat



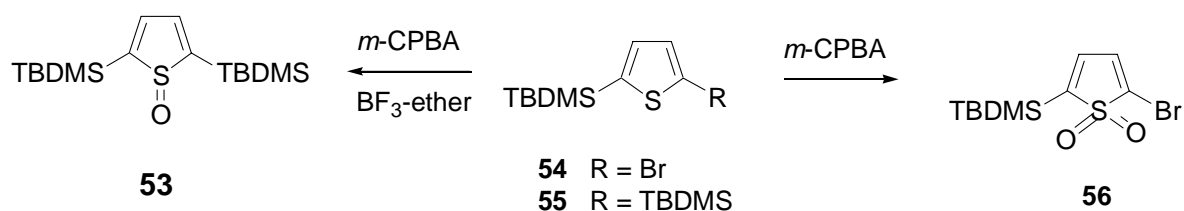
ipso-Substitution of bromine by an electrophile.



Ring cleavage of 3-thienyllithium derivatives.

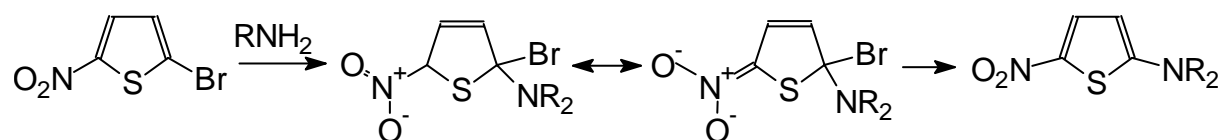


Heterocycles, **1998**, 227.

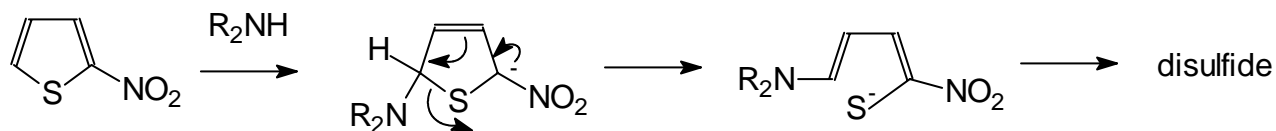
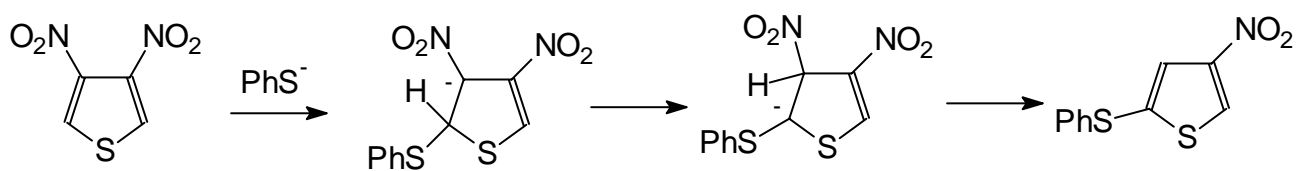


Heterocycles, **1998**, 793.; *J. Org. Chem.* **1998**, 5497.

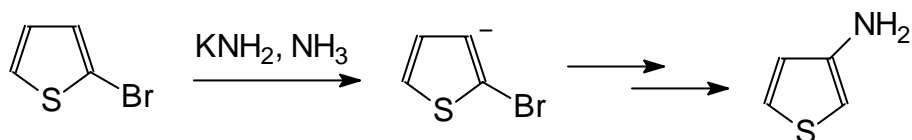
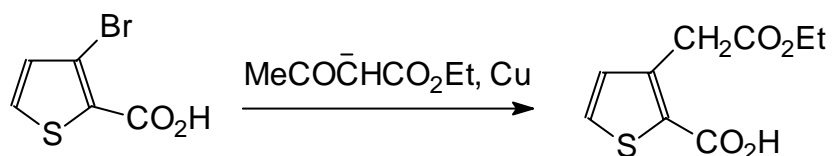
6.3.4 Nucleophilic and radical substitution



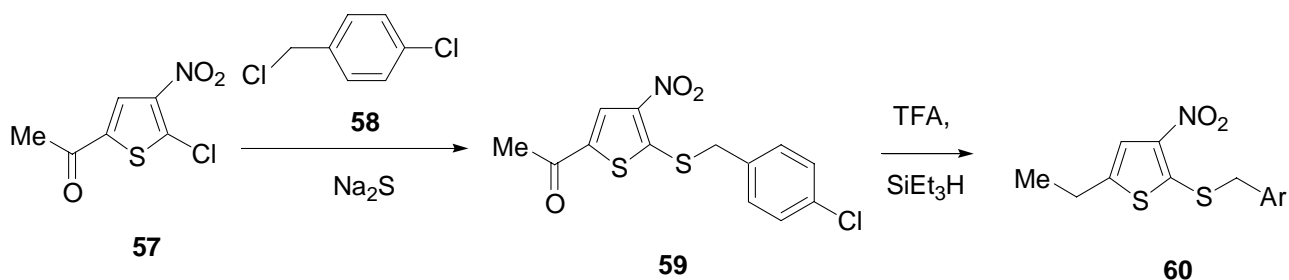
Nucleophilic displacement by the addition-elimination mechanism.



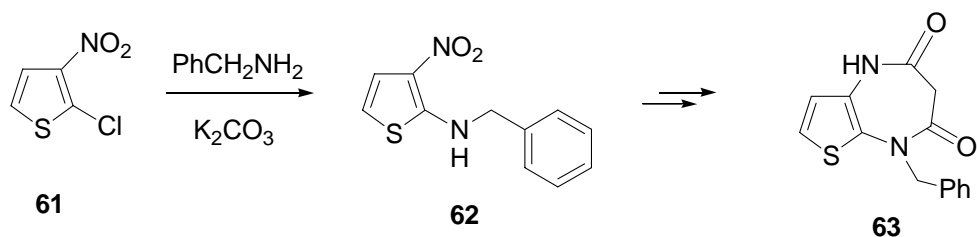
cine-substitution and ring cleavage by nucleophiles.



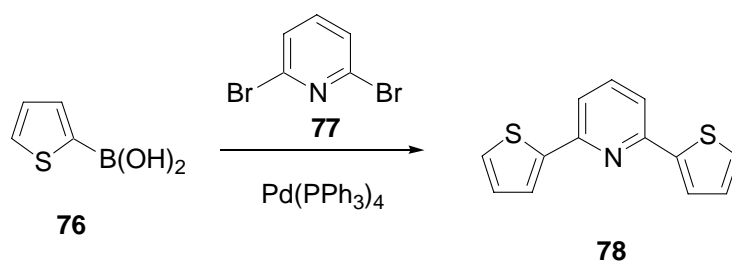
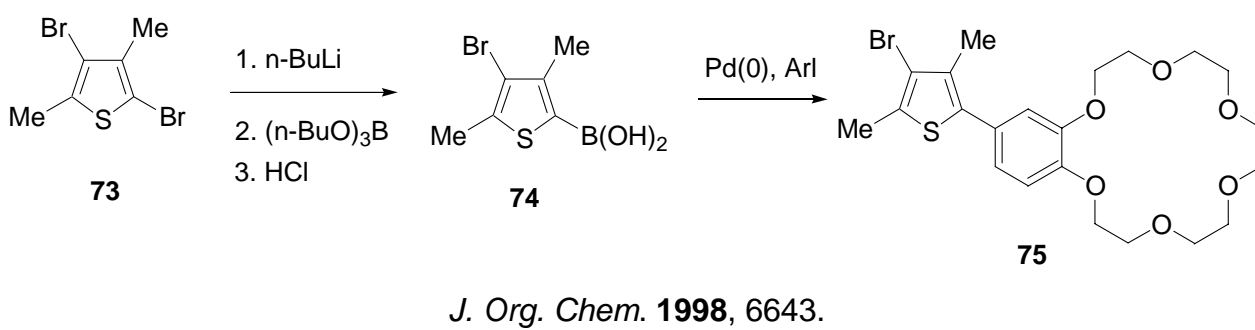
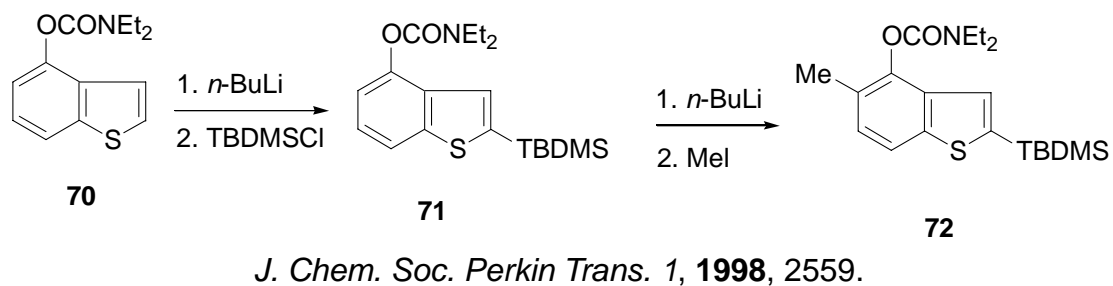
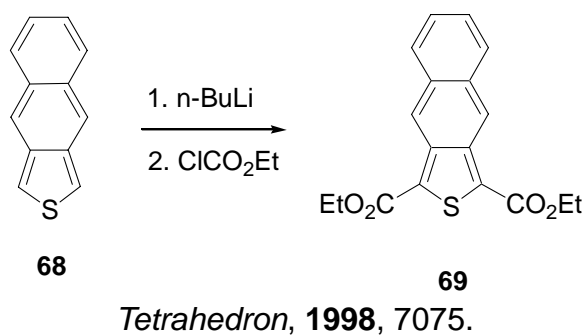
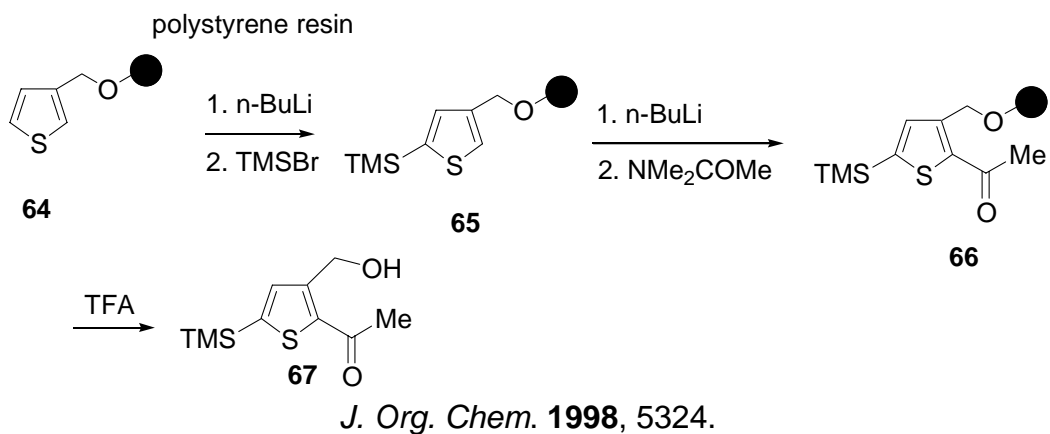
Nucleophilic substitution in unactivated thiophenes.

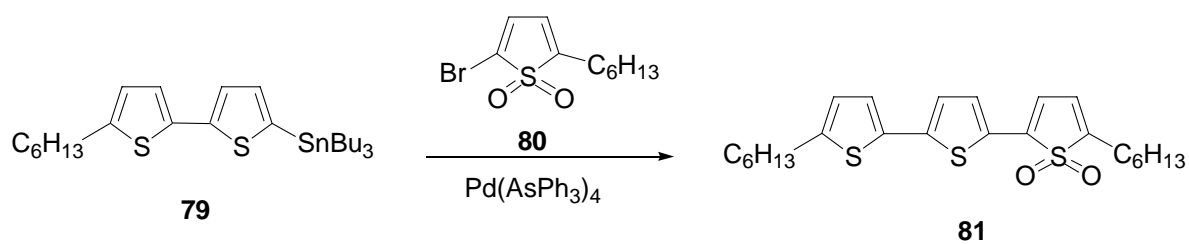


J. Heterocyclic Chem. **1998**, 1521.

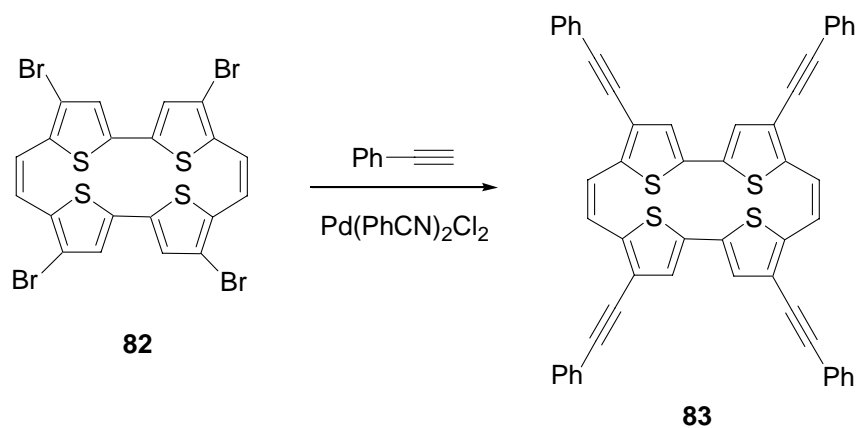


Heterocycles, **1998**, (48)1555.

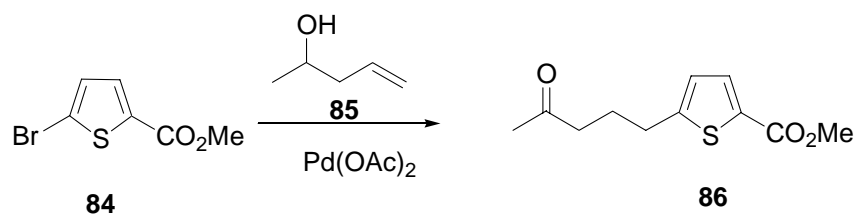




J. Org. Chem. 1998, 5497.

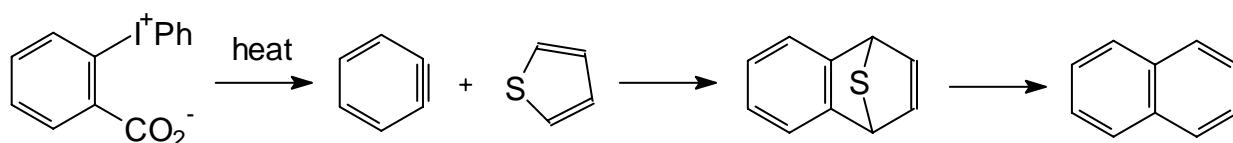


Eur. J. Org. Chem. 1998, 525.



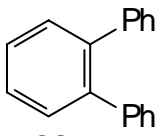
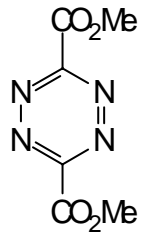
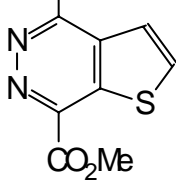
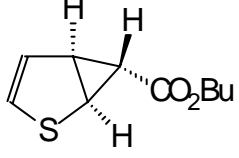
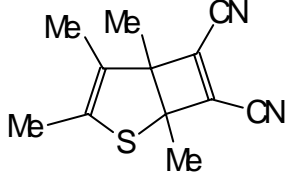
Heterocycles, 1998, (48), 1537.

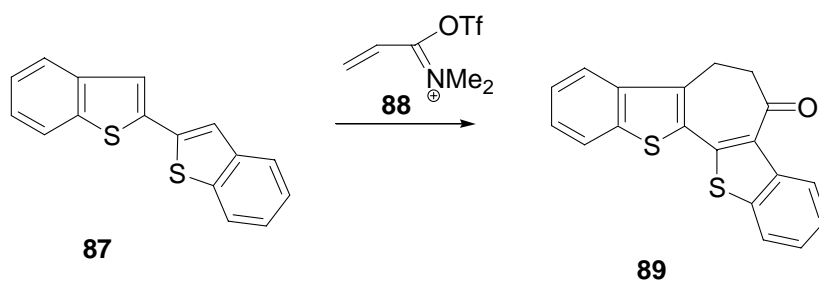
6.3.5 Addition and cycloaddition reaction



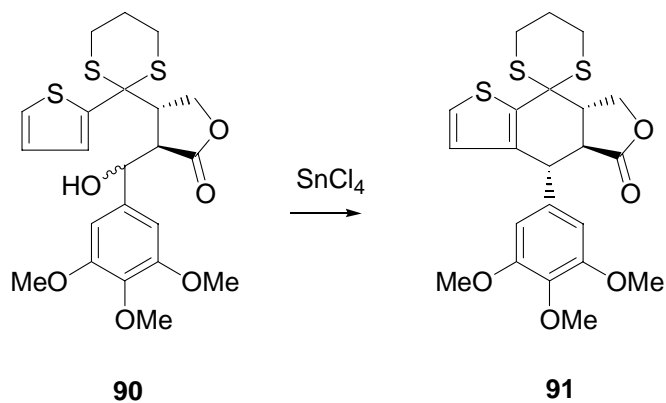
Diels-Alder reaction of thiophene with benzyne.

Table. Some cycloaddition reactions of thiophenes

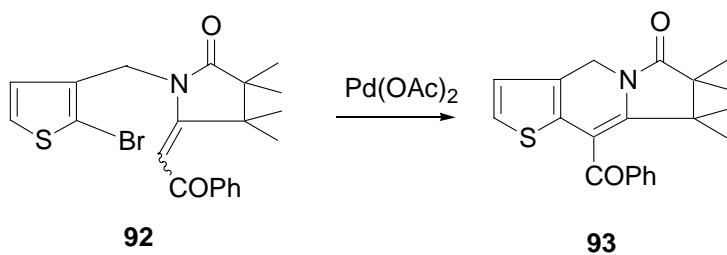
Thiophene substituents	Reagents	Conditions	Products
None	$\text{PhC}\equiv\text{CPh}$	200- 280°C 44 h	
None (also with 2,5- Me ₂)		Room temp.	
None	$\text{N}_2\text{CHCO}_2\text{Bu}$	Rh(II), 85°C	
2,3,4,5- Me ₄	$\text{NOC}\equiv\text{CCN}$	AlCl_3 , 0°C	



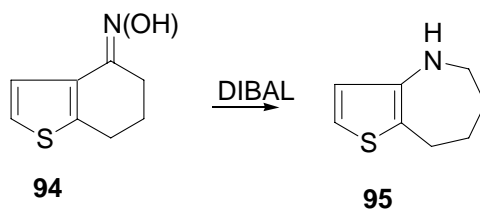
J. Org. Chem. **1998**, 6132.



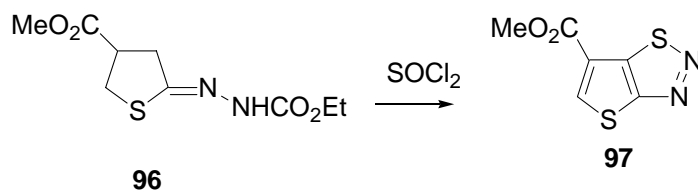
Tetrahedron Lett. **1998**, 2001.



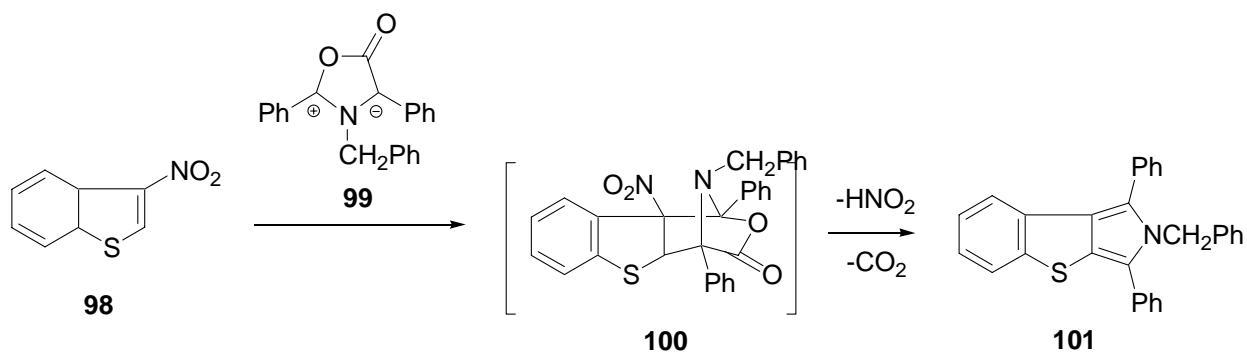
Syn. Commun. **1998**, 1839.



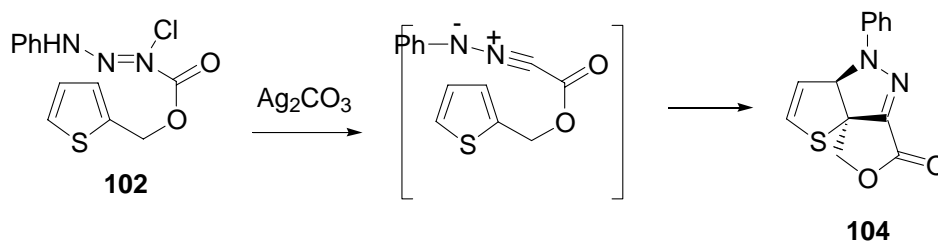
Heterocycles, **1998**, (48), 919.



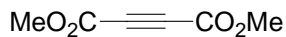
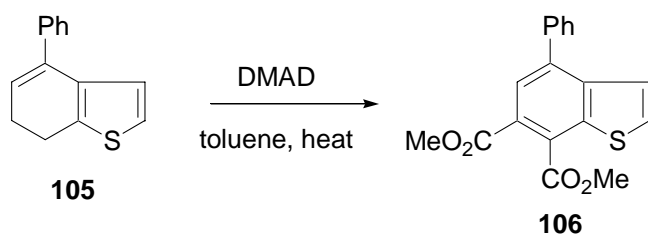
J. Chem. Soc. Perkin Trans. 1, **1998**, 853.



Synlett, **1998**, 1061.

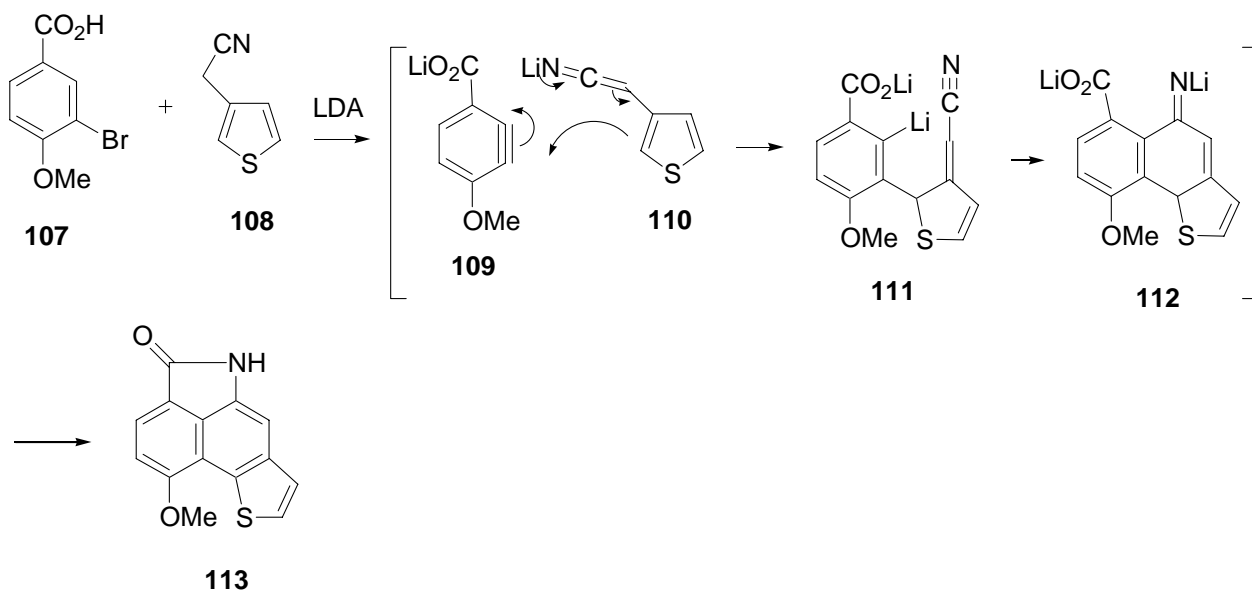


J. Chem. Soc. Perkin Trans. 1, **1998**, 4103.

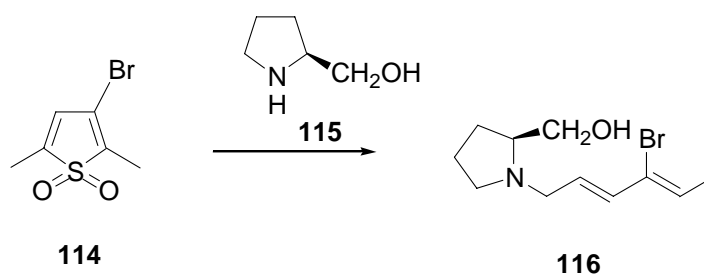


DMAD = Dimethyl acetylenedicarboxylate

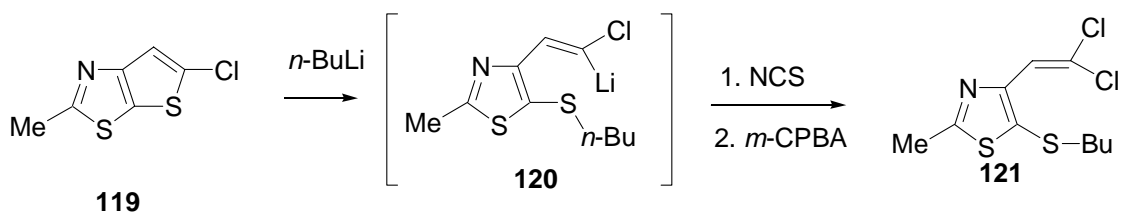
Syn. Commun. **1998**, 2531.



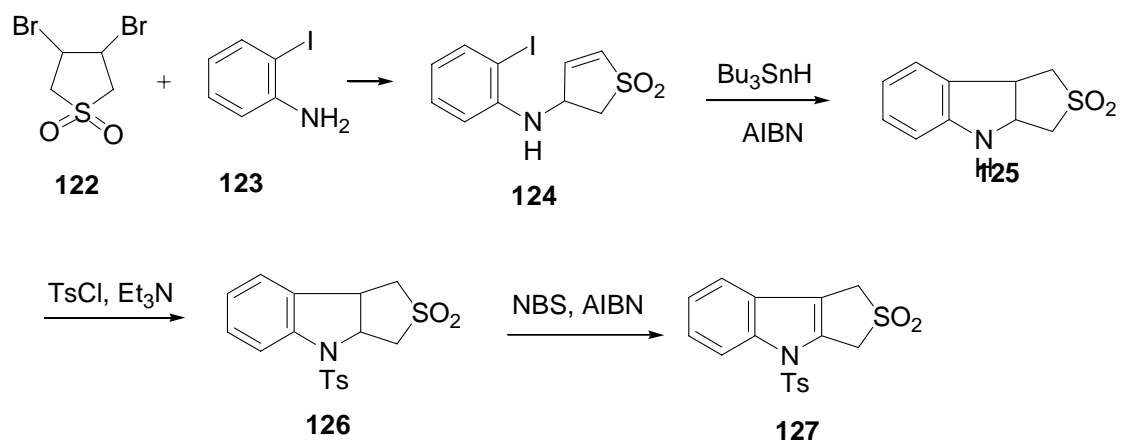
J. Chem. Soc. Perkin Trans. 1. **1998**, 1461.



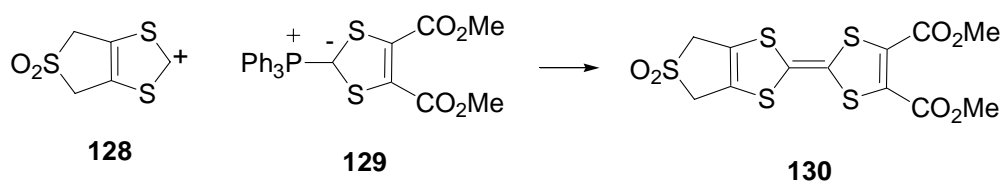
Tetrahedron, **1998**, 1817.



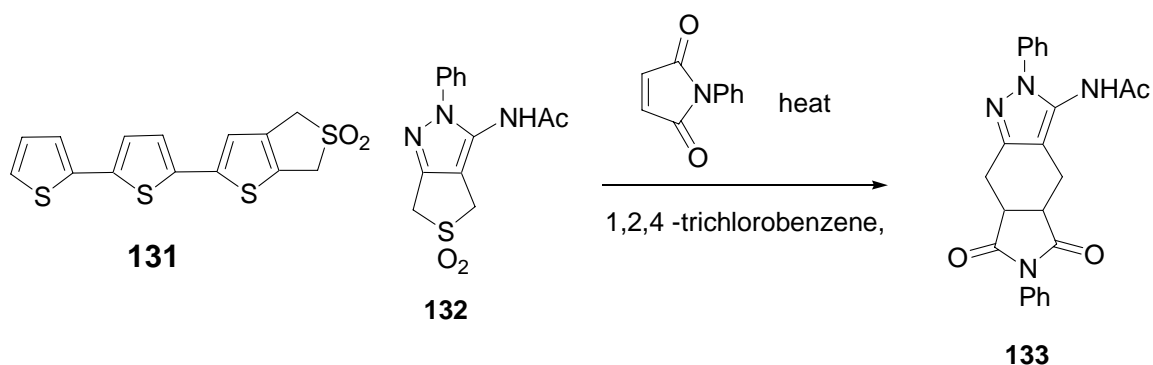
Synlett, **1998**, 407.



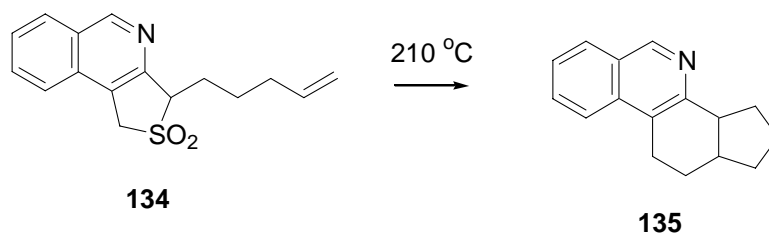
J. Org. Chem. **1998**, 4645.



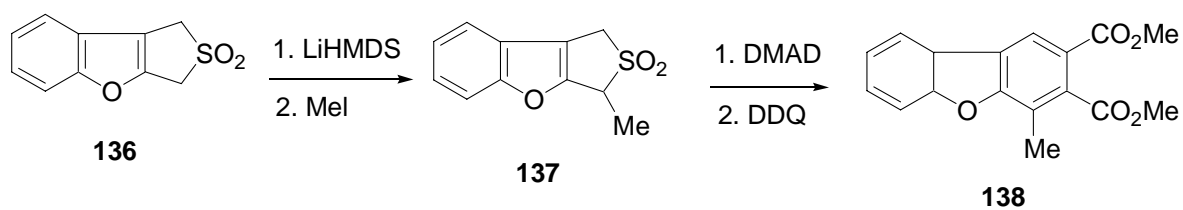
J. Am. Chem. Soc. **1998**, 330.



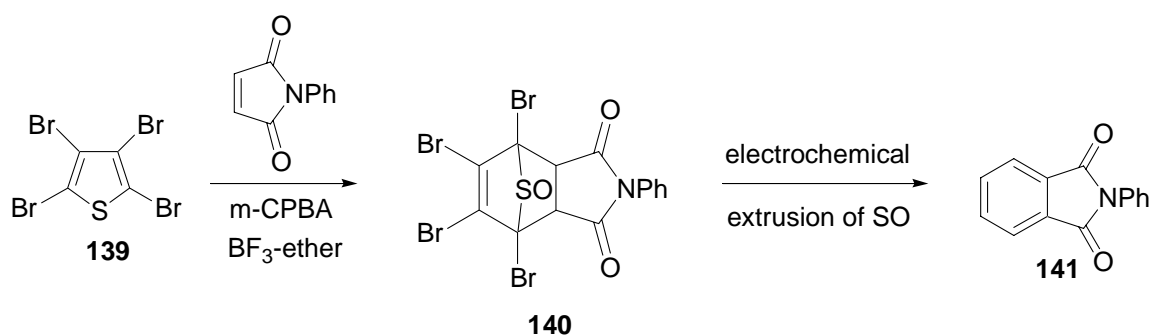
Synthesis, **1998**, 1331.



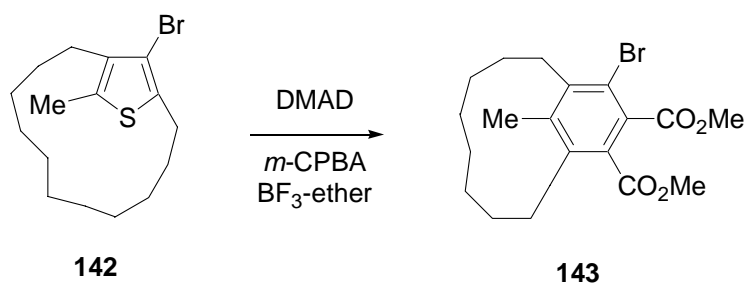
Tetrahedron, **1998**, 12609.



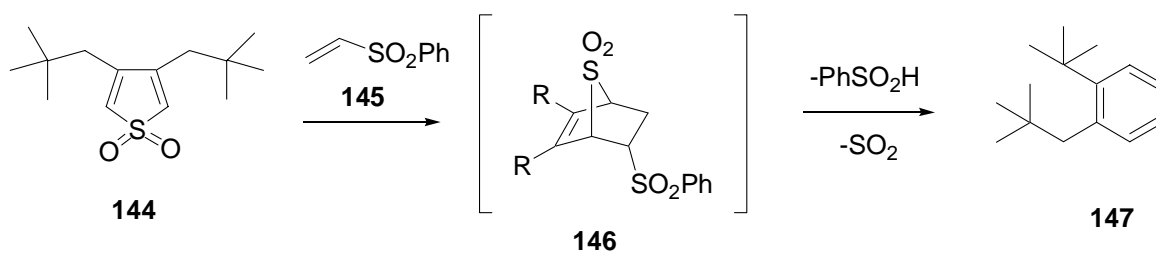
J. Org. Chem. **1998**, 4645.



J. Chem. Rev. (S), **1998**, 346.

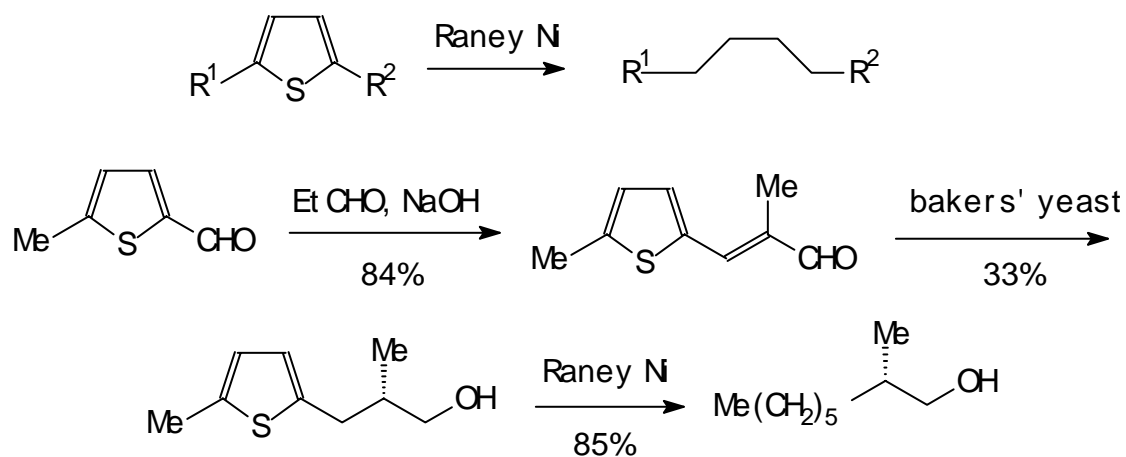


Eur. J. Org. Chem. **1998**, 1841.

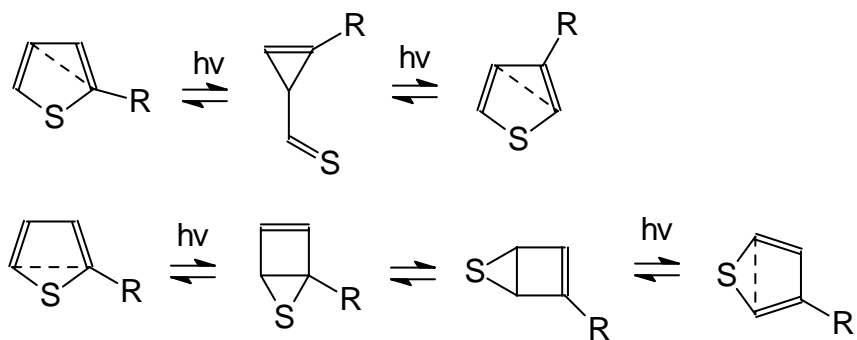


J. Org. Chem. **1998**, 4912.

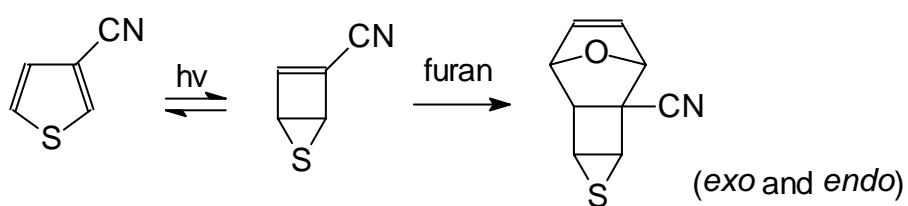
6.3.6 Reductive desulfurization



6.3.7 Photochemical isomerization



Alternative methods of photoisomerization of thiophenes.



Interception of a valence tautomer of thiophene-3-carbonitrile.