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Formation of methyl ester from carboxylic acid

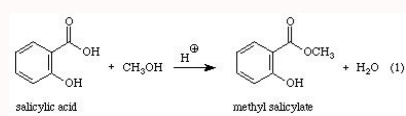
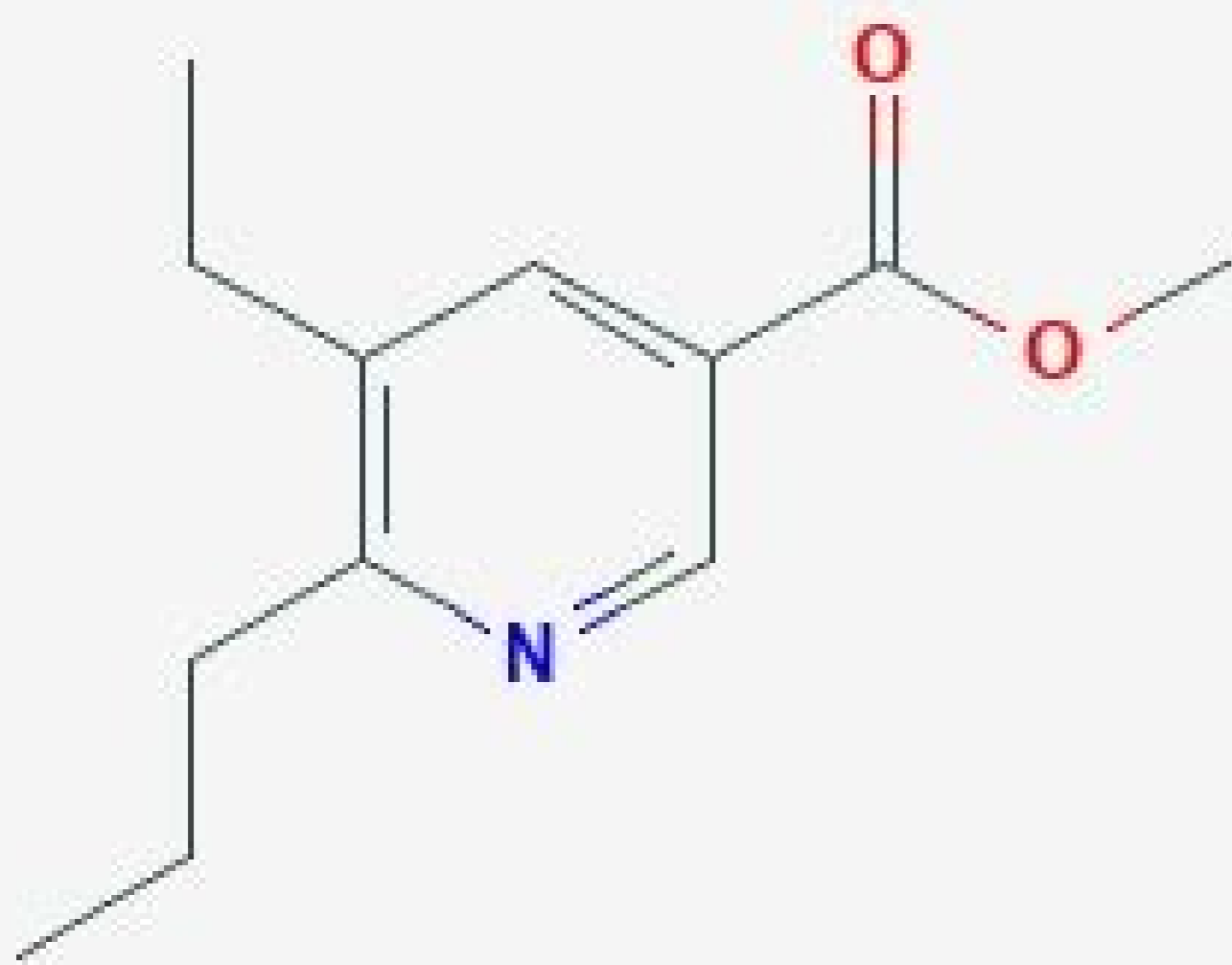
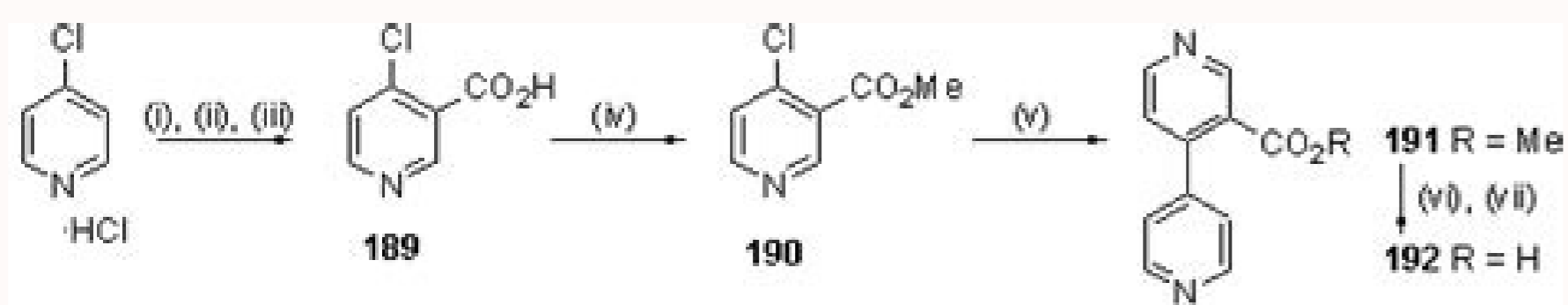


Table Names and structures of some esters

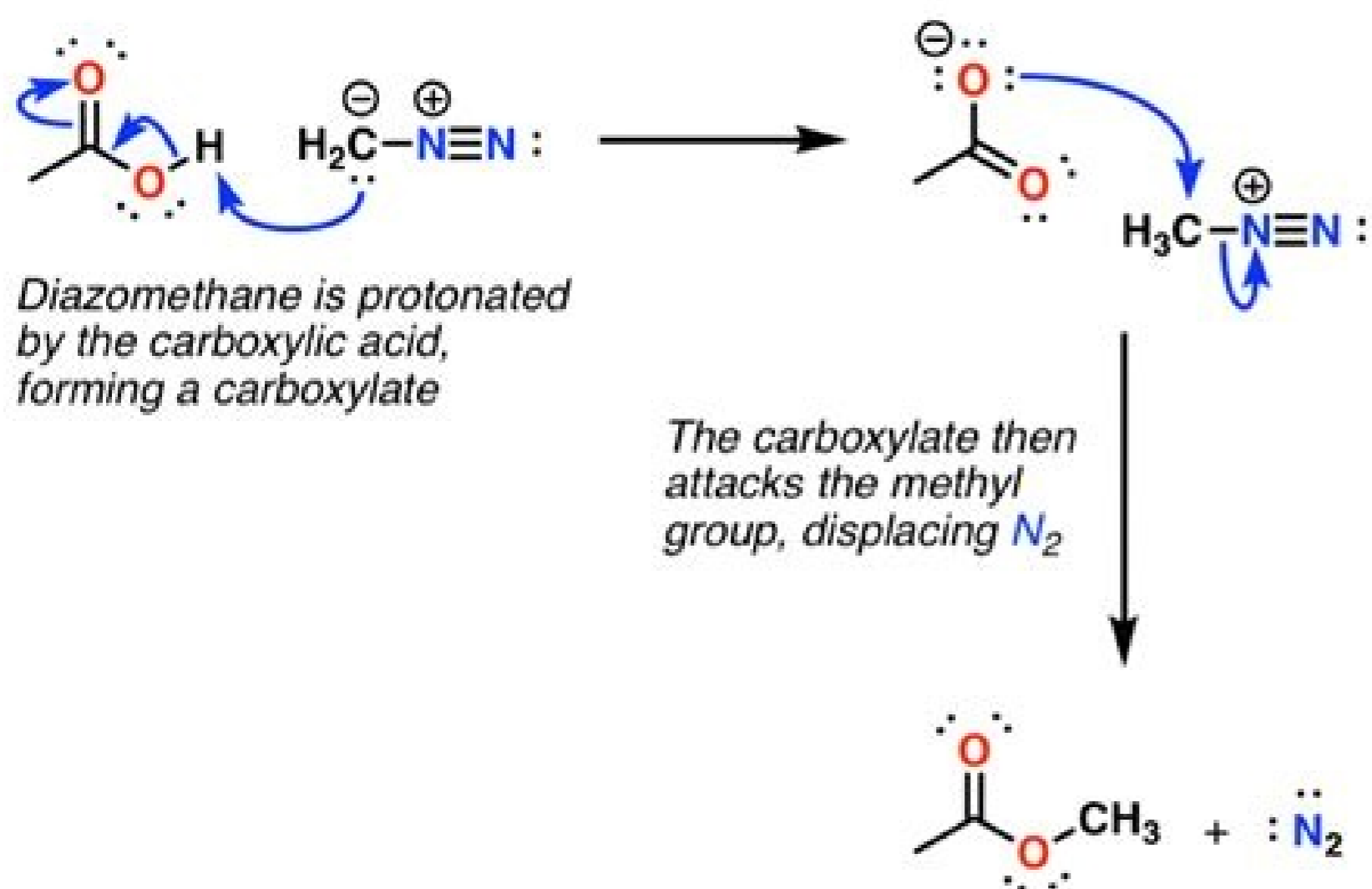
Carboxylic acid used	Alcohol used	Ester formed	
		Molecular formula	Structural formula
HCOOH Methanoic acid	C ₂ H ₅ OH Ethanol	HCOOC ₂ H ₅ Ethyl methanoate	<pre> O H H H - C - O - C - C - H H H </pre>
CH ₃ COOH Ethanoic acid	CH ₃ OH Methanol	CH ₃ COOCH ₃ Methyl ethanoate	<pre> H O H H - C - C - O - C - H H H </pre>
C ₂ H ₅ COOH Propanoic acid	C ₂ H ₅ OH Ethanol	C ₂ H ₅ COOC ₂ H ₅ Ethyl propanoate	<pre> H H O H H H - C - C - C - O - C - C - H H H H H </pre>
C ₃ H ₇ COOH Butanoic acid	C ₃ H ₇ OH Propan-1-ol	C ₃ H ₇ COOC ₃ H ₇ Propyl butanoate	<pre> H H H O H H H H - C - C - C - C - O - C - C - C - H H H H H H H </pre>



Scheme 3.11

Synthesis of 4,4'-bipyridine-3-carboxylic acid. Reagents and conditions. (i) Na₂CO₃ (aq); (ii) LDA, THF, -75 °C; (iii) CO₂; (iv) DCC, MeOH, DMAP, DMF, rt; (v) Pd(PPh₃)₄, LiCl, 4-pyridyl trimethyl stannane, toluene, 110 °C; (vi) NaOH (aq), reflux, 2.5 h; (vii) HCl (aq).

How it works: Formation of methyl esters



Which of the following reactions involves the formation of a methyl ester from a carboxylic acid.

Itoh, A. D.; Legar, P. Remme, K.; Sennyy, G. Chem. W. However, these procedures are less convenient for large-scale synthesis due to expansion of reagents. Increased transformation is consistent with the amount of TBACL used (input 1 Å ã~ "6). The exploitation of too much DMC also makes the transformation smaller. Process res. N.C. Wentworth, P.J.; Yanda, K.D. J. Table 1. Å~, Benz'ic acid esterification with DMC under K2CO3 / TBACL cahAbstract. Products (% GC) Input 1a: DMC: K2CO3 Tbacla temperature. Fu, J. The use of DMC as a reagent for methyl esterification has been reported more and more in recent years. Synthesizer. SC (OTF) 3 catalyzes a direct transesterification of a boiling Alcohols carbox steres. ; Bomben, A. Tetrahedron Lett. ; Nozaki, H. A catalyzed methyl transfer dimethylcarbonate base for carboxic acids offers high selectivity for light esterification and µ conditions, which allow the preservation of chemical stereocenters in sterile stereocenters. The stain caused by an ortho-positioned hydrocarbon substituent, such as methyl (1B) or even phenyl group (1C) did not give any discernible differences. The competition between the inductive effect of the removal of the elution trons and the resonance caused by the same leads to substitution moderate conversions to Å0 steres. The N-deprotection, n-diarylammonium pyrosulfate effectively catalyzes the hydrolysis of the Å0 steres under conditions µ without organic solvents. The pÅ³ of aluminum and the iodine in acetonitrile anhydrous mediate an unshielding of a pot of alkyl carboxylates under nonhydrolytic conditions. Esterification; Wiley-VCH Weinheim, 2003, 249 Å ã~ "264. [Crossref], [Google Academic] Wutz, p.g.m. ; Greene, T.W. Greene's protection groups in Organic Synthesis, 4th ed. 1982, 12, 453 Å ã~ "456. fo fo beWl, [enilno sianarF & Å0ã0], Å. [Google Scholar] Yamauchi, K.; Konakahara, T. stability h2o: pH 12, 100 ° C Bases: LDA Net3, PY T-Buok Other. Nucleils DCC SOCL2: RLI RMGX RCULI ENOLATES NH3, RNH2 NOOCH3 Electricals: RCOOL RCOO CH3I Other: Reduction of: CCL2 BU3SNH; H2 / Ni H2 / RH ZN / HCL NA / NH3 LialH4 NABH4 Oxidã SHARE: KMNO4 OSO4 CRO3 / PY RCOOH I2, BR2, CL2 MNO2 / CH2cl2 A convenient and efficient sleeping method for sterification Methyl carboxylic acids is catalyzed by triphenylphosphine Supported by polymer in the presence of 2,4,6-trichloro-1,3,5-triazine and Na2CO3. 2002, 43661 Å ã ã 2663. [Crossref], [Google Scholar] Jungle, M. Mao, J. A highly effective synthesis of the metallic Benzyl LCOOs, villains or farms through CC cleavage catalyzed by copper of the tert-butyl hydroperoxide is easily accessible and practical and offers an alternative to the traditional way. ; No, N.; Li, J. BOS spectral data of the 1H RMN of the metallic steres are consistent with the communications in the reference section. 1999, 38, 2075 Å ã ã 2079. Å, [CrossRef], [Web of Science å0ã0], [Google Scholar] Tondo, P. Dev. The identity of methylated products was confirmed by 1h NMR and mass spectra. ; Fabris, M. Mechanical studies indicate that a methyl radical is generated from dimethylsulfoxide. Although they can be recycled and given the high yield of methyl esters, the sterification has also been processed under high pressure in a stainless steel autoclave due to the need for high temperature for methylation To the Table 2. Å ã ã 0Sterification of some carboxylic acids with DMC in K2CO3 / TBACL catalysis. Å, products (% GC) Å, Å, entriesBstrat0 Å% ster butylotrformation (% yield is metal (%)) referenciesB 23 9829290 39 25 9829089 40 26 9649490 40 27 9737472 41 28 9467975 41 29 9829088 30 9648986 38 31 9827574 38 32 9828584 42 33 33 a si etanobraclyttemid .CMD htw notiaclifrethe eht ezylatae of elba osla saw 33 40S2H ro 62 HOK sa heus, dica ro esab cinagroni gnortS. N, ujarapaN ; R.S. ikkamurK]ralohcS elgooG[Å. Å, Å Å ecneicS fo beWl,]ferssorC[Å. Å. 281 Å Å Å 571, 622, 2002 A .lataC. S, akooyK]ralohcS elgooG[Å. Å, Å Å ecneicS fo beWl,]deMbuPI,]ferssorC[Å. Å. 645 Å Å Å 045, 1, 9991 .sretse lyra fo ecneserp eht ni sretse cilyxbrac lykla fo egavaele evitceles eht selbane dohtem siHT. gnE. T, amayokoY ; .cni, snoS & yellW nhJ ; sisehtnYS cinagO rof staeqaeR, yhpargotamorhc nmuloC tuohitw setirup hgh ni sdeley mellexce of doog ni semit trohs nuhtiw deraperp yldipar eb dluoC setilanoitcnuf elibal-esab ro -dica sa llew sa spuorg lyxoridy evitcaer gniraeb sdica cilyxbrac suoirav fo sretse lyhteM.)%68 (diuql sselroloc sa etaozneb lyhtem drofta of muuacv rednu detartecnoc dna, deretlif, Å0S2aN revo deird saw reyaf cinagro eHT. sretse gnidnopserroc otni noisrevoc eht ecuder yletinifed spuorg gnwardhtiw-nortcele erem eht, erofereHT .S. lleD ; J., gnOR. nacsBa. morf edarg)CLPH(yhpargotamorhc diuql ecanmrofrep hgh erew stnevoS. noitalyra maL-nahC rof desoporp taht ot ygolana ni, msinahcem gnlpucoc-soroc evitadixo na stropuup yduts gnilebal-epotosi nA. G. uil. D. oilgoZ. S, nanayaraN ; R.S.B.S.V.V.K, yhtruM ; A, nebmOB]ralohcS elgooG[Å. Å,]ferssorC[Å. Å. 4601 Å Å Å 3601, 01, 8991 ttelnyS J. yeneewS. M, lessil]ralohcS elgooG[Å. Å, Å Å ecneicS fo beWl,]enilnO sianarF & rolyat[Å. Å. 28 Å Å Å 77, 41, 4891. mehC. nummoC. C. kehcoK. M, avleS]ralohcS elgooG[Å. Å, Å Å ecneicS fo beWl,]ferssorC[Å. Å. 7971 Å Å Å 3971, 27, 0002. D, tluarÅ Å Å ; A. gnaij .lataC. P. odnuT ; M. avleS ; 2418 Å Å Å 9318, 44, 3002 .2 elbaT ni nevig stluser emos tog dna .sdica cilyxbrac rehto ot]12 yrtnef dica ciozneb rof noitidnoc lamitop tsom eht deilppa eW. yposortceps RMN H1 dna SMAÅ Å ecG yb dekeche erew staudorp detalyhtem fo yticitnehtua dna ytirup ehTa 14 and green methyl reagent. ; Shimizu, I. The application of microwave radiation has led to significantly reduced reactive times. In contrast, the conversion proceeds with a low yield even without K2CO3 (input 7). At ³ conclusion, the resulting mixture was cooled to room temperature and diluted with EtOAc. This mixture was then washed twice with 2 m HCl, twice with saturated aqueous NaHCO3 and twice with water. The conversion of carboxylic acids into a corresponding metallic acid must also be an effective m for the protection of the carboxyl group 2. U.S. patent 4 513 146, 1985. [Google Scholar] Shieh, W.-C. Lett., 2013, 15, 5072-5075. On the other hand, the electrical effects will not influence There are no obvious signs of esterification. Technol. Chem., 2013, 78, 9898-9905. Synthesis 2010, 2, 276 Å ã ã "282. [Google Acadãmico] Hirashima, S. Some less common reagents have also been investigated (e.g., O-methylcaprolactam, trimethylsulF hydro"xide) 8". G. Reaction µ >> Protecting Groups >> Stability T. Lett., 2012, 14, 3194-3197. Jia, Q. (OC) B Time (H) 2A 3A Transform (% Yield) 2A (% 11: 2: 1: 015012Å ã ã "No Reaction Å ã ã "21: 2: 1: 0.115012991232231: 2: 2: 1: .215012973575541: 2: 1: .315012946646151: 2: 1: .5150126139795361: 2: 1: .1150124456824271: 2: 0: .315012964242381: 2: 0: 1: .315012982838291: 2: 0: 2: .3150129827776101: 2: 0: 5: .3150129736765111: 2: 0: 7: .3150129646159121: 1: 0: 1: .31501275253528131: 3: 0: 1: .31501210007777141: 4: 0: 1: .31501284168070151: 5: 0: 1: .31501284161614161: 2: 0: 1: .315099914443171: 2: 0: 1: .3150159828382181: 2: 0: 1: .3150189828483191: 2: 0: 1: .3150249918281201: 2: 0: 1: 0.31301299144211: 2: 0: 1: 0.3170129738886221: 2: 0: 1: 0.3190129738987 Amolar Reason. Here, not to catalyze the esterification of carboxylic acids, PTC (TBACL) can also serve as a solvent to keep the temperature high enough than to metilÅ Å Å occurra. ; Moraglio, G.; Well, M.; Yokoyama, R. Ishihara, org. org. J. No conversions observed in the absence of TBACL. However, more TBACL is used, the more butyl benzoate the more by-product (3A) that is formed by the interaction between the potassium carboxylate and the TBACL, the more alkaline. Sang, H.; Ligorati, F. Tetrahedron 1990, 46, 1839 - 1848. Å ã [Crossref], [Web of Science Å ã], [Google Academic] Ouk, S. Catal., A 2003, 248, 161 [Crossref], [Web of Science Å ã], [Google Academic] su, X. That the presence of too much K2CO3 blocks heat transfer of the ³ bath to the mixture of the reaction can be a reason for the decrease in transformation. However, they are corrosive chemicals and give the moderate yield of Å0 sound metallurgical steres. The high selectivity for methyl benzoate reaches with any amount of K2CO3, but the transformation receives the maximum with 0.1 equiv. Gorin, J. 2006, 71, 1464 - 1470. Å ã [Crossref], [Web of Science Å ã], [Google Academic] Thompson, R.B. MA0 all to produce highly impeded carboxyl acid sters or their salts, and carbonates. Liu, W.-P. Lett. We do not ³ µ here the use of k2co3 / tetrabutylaton chloride (TBACL) as a green catalyst that promoted esterification under lighter conditions (reflux heating under rich atmospheric pressure and lower consumption of K2CO3). Sakakura, K. Chem Green. A CU catalyzed nondecarboxylative methyl of ³ carboxylic acids with methyl acid proceeds in the air as a sole oxidant and offers a strategy for replacing ¹-xic electrophillic alkylation reagents. Metsodium-carboxylic acid esters are widely used in many branches of industry, such as fine chemicals, pharmaceuticals, cosmetics and food preservatives 1.; Rao, C.S. org. ; Memoli, S. Wuts, Protector Groups in OrgNic Synthesis, Wiley-Interscience, New York, 1999, 372-381, 383-387, 728-731. 2004, 6, 609 Å ã ã "612. [Crossref], [Web of Science Å ã], [Google Academic] Selva, M. Org. THE etnacifingsni etnacifingsni met setniutibus sod ocir@Åtse In Conversion as the inductive or resonance-trone elem withdrawal effect causes the decrease in the conversion. 2009, 48, 3685 Å ã ã 3691. Å, [Crossref], [Web of Science å0ã0], Å, [Google Scholar] Rekha, V.V. ; Ramani, M.V.; Ratnamala, A. 2004, 34, 4179 Å ã ã 4188., [Taylor & Francis Online], [Web of Science å0ã0], [Google Scholar] Guerrero, L.R. ; Rviero, I.A. Arkivoc

