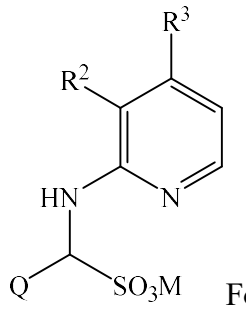
CLAIMS

What is claimed is:

1. A method of preparing a compound of Formula **B:**



Formula B

wherein Q is a 3- to 10- membered ring system containing ring members selected from carbon atoms and up to 4 heteroatoms independently selected from up to 2 O, up to 2 S, and up to 4 N, wherein up to 3 carbon atom ring members are independently selected from C(=O) and C(=S) and such ring system is optionally substituted with up to 5 substituents independently selected from R^A;

each R^A is independently halogen, hydroxy, SF_5, C(O)(C_1-C_8 alkyl), C(O)O(C_1-C_8 alkyl), N(C_1-C_8 alkyl)(C_1-C_8 alkyl), C(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), C(=S)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), SO_2N(C_1-C_8 alkyl)(C_1-C_8 alkyl), OC(O)(C_1-C_8 alkyl), OC(O)O(C_1-C_8 alkyl), OC(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), N(C_1-C_8 alkyl)C(O)O(C_1-C_8 alkyl), N(C_1-C_8 alkyl)C(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), OSO_2(C_1-C_8 alkyl), OSO_2N(C_1-C_8 alkyl)(C_1-C_8 alkyl), N(C_1-C_8 alkyl)SO_2(C_1-C_8 alkyl), or C_1-C_8 alkyl, C_1-C_8 haloalkyl, C_2-C_8 alkenyl, C_2-C_8 alkynyl, C_3-C_{10} cycloalkyl, C_3-C_{10} halocycloalkyl, C_4-C_{10} alkylcycloalkyl, C_4-C_{10}

cycloalkylalkyl, C_6-C_{14} cycloalkylcycloalkyl, C_5-C_{10} alkylcycloalkylalkyl, C_3-C_8 cycloalkenyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_3-C_8 cycloalkoxy, C_3-C_8 halocycloalkoxy, C_4-C_{10} cycloalkylalkoxy, C_2-C_8 alkenyloxy, C_2-C_8 alkynyloxy, C_1-C_8 alkylthio, C_1-C_8 alkylsulfinyl, C_1-C_8 alkylsulfonyl, C_3-C_8 cycloalkylthio, C_3-C_8 cycloalkylsulfinyl, C_3-C_8 cycloalkylsulfonyl, C_4-C_{10} cycloalkylalkylthio, C_4-C_{10} cycloalkylalkylsulfinyl, C_4-C_{10} cycloalkylalkylsulfonyl, C_2-C_8 alkenylthio, C_2-C_8 alkenylsulfinyl, C_2-C_8 alkenylsulfonyl, C_2-C_8 alkynylthio, C_2-C_8 alkynylsulfinyl or C_2-C_8 alkynylsulfonyl; or

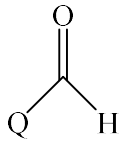
two R^A substituents on adjacent ring atoms are taken together to form a 5- to 7-membered carbocyclic or heterocyclic ring, each ring containing ring members selected from carbon atoms and up to 3 heteroatoms independently selected from up to 2 O, up to 2 S, and up to 3 N, wherein up to 2 carbon atom ring members are independently selected from C(O) and C(=S) and such ring is optionally substituted with up to 3 substituents independently selected from the group consisting of halogen, hydroxy, C_1-C_4 alkyl, C_1-C_4 haloalkyl, C_2-C_4 alkenyl, C_2-C_4 haloalkenyl, C_2-C_4 alkynyl, C_2-C_4 haloalkynyl, C_3-C7 cycloalkyl, C_3-C7 halocycloalkyl, C_4-C_8 alkylcycloalkyl, C_4-C_8 haloalkylcycloalkyl, C_4-C_8 cycloalkylalkyl, C_4-C_8 halocycloalkylalkyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_2-C_8 alkoxycarbonyl, C_2-C_6 haloalkoxycarbonyl, C_2-C_6 alkylcarbonyl and C_2-C_6 haloalkylcarbonyl;

each of R^2 and R^3 is indepedently H, F, C_1-C_4 alkyl or C_1-C_4 haloalkyl; and

M is an inorganic cation or organic cation;

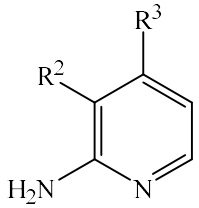
comprising:

(a) contacting a compound of Formula **A**



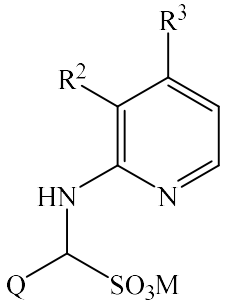
Formula A

with a compound of Formula **J**



Formula J

and a salt comprising at least one bisulfite salt, at least one metabisulfite salt, or mixtures thereof to form a compound of Formula **B**

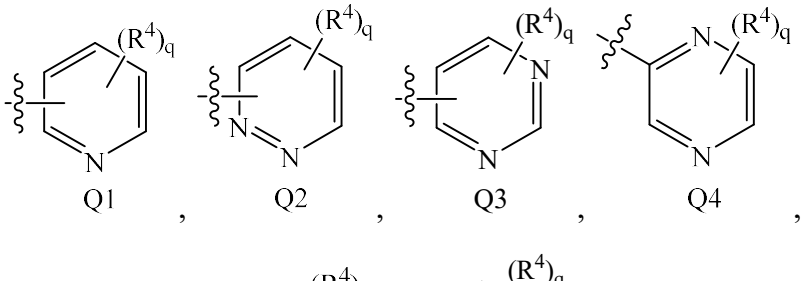


Formula B,

wherein M is at least one inorganic cation, at least one organic cation, or mixtures thereof derived from the salt.

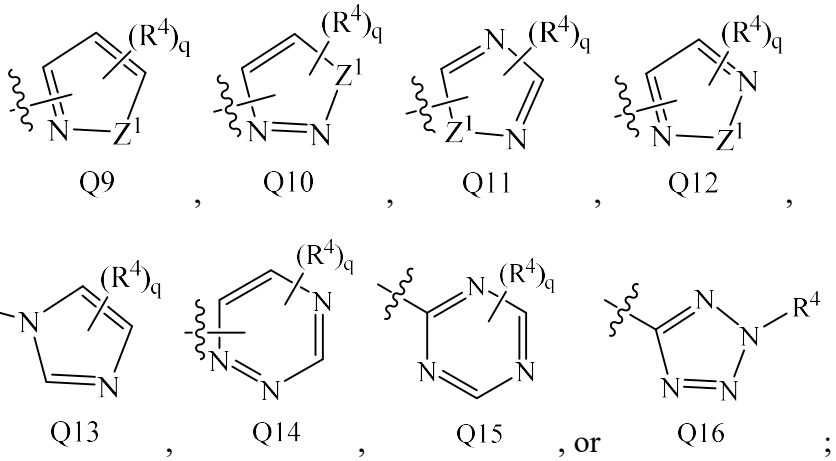
2. The method of claim 1, wherein Q is triazolyl, pyridinyl, or pyrimidinyl, each optionally substituted with up to 2 substitutions independently selected from the group consisting of halogen, C_1-C_8 alkyl, C_1-C_8 haloalkyl, C_3-C_{10} cycloalkyl, C_3-C_{10} halocycloalkyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_3-C_8 cycloalkoxy, C_3-C_8 halocycloalkoxy, and C_4-C_{10} cycloalkylalkoxy.

3. The method of claim 1, wherein Q is selected from one of the following ring structures:



Q1 , Q2 , Q3 , Q4 ,

Q5 , Q6 , Q7 , Q8 ,



Q9 , Q10 , Q11 , Q12 ,

Q13 , Q14 , Q15 , or Q16 ;

wherein Z^1 is O, S, or NR^5;

each R^4 or R^5 is independently H, halogen, hydroxy, SF_5, C(O)(C_1-C_8 alkyl), C(O)O(C_1-C_8 alkyl), N(C_1-C_8 alkyl)(C_1-C_8 alkyl), C(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), C(=S)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), SO_2N(C_1-C_8 alkyl)(C_1-C_8 alkyl), OC(O)(C_1-C_8 alkyl), OC(O)O(C_1-C_8 alkyl), OC(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), N(C_1-C_8 alkyl)C(O)O(C_1-C_8 alkyl), N(C_1-C_8 alkyl)C(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), OSO_2(C_1-C_8 alkyl), OSO_2N(C_1-C_8 alkyl)(C_1-C_8 alkyl), N(C_1-C_8 alkyl)SO_2(C_1-C_8 alkyl), or C_1-C_8 alkyl, C_1-C_8 haloalkyl, C_2-C_8 alkenyl, C_2-C_8 alkynyl, C_3-C_{10} cycloalkyl, C_3-C_{10} halocycloalkyl, C_4-C_{10} alkylcycloalkyl, C_4-C_{10} cycloalkylalkyl, C_6-C_{14} cycloalkylcycloalkyl, C_5-C_{10} alkylcycloalkylalkyl, C_3-C_8 cycloalkenyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_3-C_8 cycloalkoxy, C_3-C_8 halocycloalkoxy, C_4-C_{10} cycloalkylalkoxy, C_2-C_8 alkenyloxy, C_2-C_8 alkynyloxy, C_1-C_8 alkylthio, C_1-C_8 alkylsulfinyl, C_1-C_8 alkylsulfonyl, C_3-C_8 cycloalkylthio, C_3-C_8 cycloalkylsulfinyl, C_3-C_8 cycloalkylsulfonyl, C_4-C_{10} cycloalkylalkylthio, C_4-C_{10} cycloalkylalkylsulfinyl, C_4-C_{10} cycloalkylalkylsulfonyl, C_2-C_8 alkenylthio, C_2-C_8 alkenylsulfinyl, C_2-C_8 alkenylsulfonyl, C_2-C_8 alkynylthio, C_2-C_8 alkynylsulfinyl or C_2-C_8 alkynylsulfonyl; and

each q is independently 0, 1, or 2.

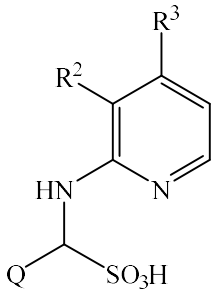
4. The method of claim 1, wherein the salt comprises sodium bisulfite, potassium bisulfite, ammonium bisulfite, trimethylammonium bisulfite, triethylammonium bisulfite, sodium metabisulfite, potassium metabisulfite, ammonium metabisulfite, trimethylammonium metabisulfite, triethylammonium metabisulfite, or mixtures thereof.

5. The method of claim 1, wherein M is sodium, potassium, ammonium, trimethylammonium, triethylammonium, lithium, or mixtures thereof.

6. The method of claim 1, wherein Step (a) is performed in the presence of a solvent comprising water, C_1-C_4 monohydric alcohol, C_2-C_6 polyhydric alcohol, or mixtures thereof.

7. The method of claim 1, further comprising:

(b) contacting the compound of Formula **B** from Step (a) with an acid comprising at least one inorganic acid, at least one organic acid, or mixtures thereof to form a compound of Formula **C**:



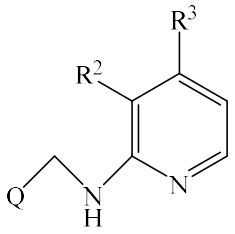
Formula C.

8. The method of claim 7, wherein the acid comprises an inorganic acid selected from hydrochloric acid (HCl), hydrobromic acid (HBr), phosphoric acid (H_3PO_4), sulfuric acid (H_2SO_4), and boric acid (H_3BO_3).

9. The method of claim 7, wherein the acid comprises an organic acid selected from formic acid, acetic acid, propionic acid, citric acid, malic acid, and sulfonic acids.

10. The method of claim 7, further comprising:

(c) contacting the compound of Formula **B** from Step (a) or the compound of Formula **C** from Step (b) with a reducing agent to form the compound of Formula **D**

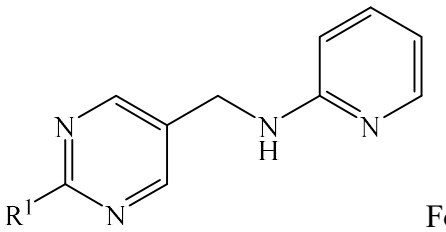


Formula D.

11. The method of claim 10, wherein the reducing agent comprises a borohydride reducing agent selected from sodium borohydride ($NaBH_4$), sodium triacetoxyborohydride ($NaBH(CH_3COO)_3$), lithium borohydride ($LiBH_4$), potassium borohydride (KBH_4), or mixtures thereof.

12. The method of claim 10, wherein the reducing agent comprises lithium aluminium hydride ($LiAlH_4$), diisobutylaluminium hydride (DIBALH), or mixtures thereof.

13. The method of claim 10 for preparing a compound of Formula **1**

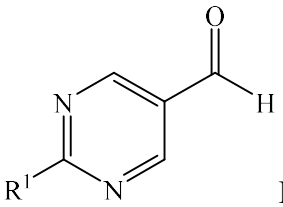


Formula 1

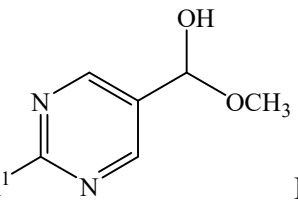
wherein R^1 is H or C_1-C_3 alkyl,

comprising:

(A) contacting a compound of Formula **2** or Formula **2a**

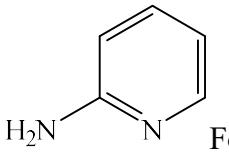


Formula 2 or



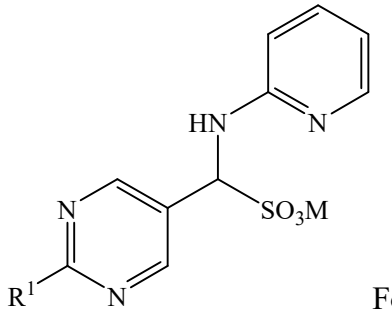
Formula 2a

with 2-aminopyridine (**3**)



Formula 3

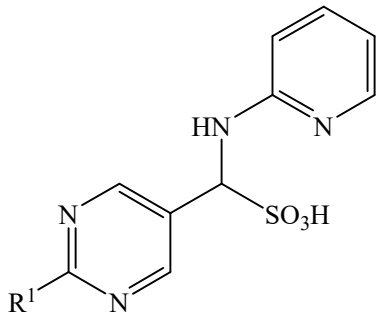
and sodium bisulfite in the presence of water to form a compound of Formula **4**



Formula 4

wherein R^1 is H or C_1-C_3 alkyl and M is Na or K or Li;

(B) contacting the compound of Formula **4** with an acid to form a compound of Formula **5**



Formula 5

wherein R^1 is C_1-C_3 alkyl; and

(C) contacting the compound of Formula **4** or the compound of Formula **5** with a borohydride reducing agent in the presence of a solvent comprising water, C_1-C_4 monohydric alcohol, C_2-C_6 polyhydric alcohol, or mixtures thereof in the optional presence of an inorganic or organic base to form the compound of Formula **1**.

14. The method of claim 13, wherein Step (C) further comprises

(i) contacting the reaction mixture with water and adjusting the pH of the reaction mixture with acid to pH less than 5,

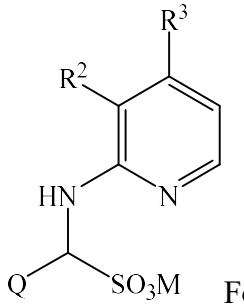
(ii) separating resulting aqueous and organic phases of the reaction mixture,

(iii) adjusting the pH of the aqueous phase to pH 5 or greater with aqueous base, and

(iv) extracting the compound of Formula **1** into an organic solvent selected from C_7-C_{10} aromatic hydrocarbons, haloalkanes, halogenated benzenes, C_5-C_{10} aliphatic hydrocarbons, and C_5-C_{10} cycloaliphatic hydrocarbons.

15. The method of claim 14, wherein the organic solvent of Step (iv) is toluene, dichloromethane, 1,2-dichloroethane or 1-chlorobutane.

16. A method for preparing a compound of Formula **B:**



Formula B,

wherein Q is a 3- to 10- membered ring system containing ring members selected from carbon atoms and up to 4 heteroatoms independently selected from up to 2 O, up to 2 S, and up to 4 N, wherein up to 3 carbon atom ring members are independently selected from C(=O) and C(=S) and such ring system is optionally substituted with up to 5 substituents independently selected from R^A;

each R^A is independently halogen, hydroxy, SF_5, C(O)(C_1-C_8 alkyl), C(O)O(C_1-C_8 alkyl), N(C_1-C_8 alkyl)(C_1-C_8 alkyl), C(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), C(=S)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), SO_2N(C_1-C_8 alkyl)(C_1-C_8 alkyl), OC(O)(C_1-C_8 alkyl), OC(O)O(C_1-C_8 alkyl), OC(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), N(C_1-C_8 alkyl)C(O)O(C_1-C_8 alkyl), N(C_1-C_8 alkyl)C(O)N(C_1-C_8 alkyl)(C_1-C_8 alkyl), OSO_2(C_1-C_8 alkyl), OSO_2N(C_1-C_8 alkyl)(C_1-C_8 alkyl), N(C_1-C_8 alkyl)SO_2(C_1-C_8 alkyl), or C_1-C_8 alkyl, C_1-C_8 haloalkyl, C_2-C_8 alkenyl, C_2-C_8 alkynyl, C_3-C_{10} cycloalkyl, C_3-C_{10} halocycloalkyl, C_4-C_{10} alkylcycloalkyl, C_4-C_{10} cycloalkylalkyl, C_6-C_{14} cycloalkylcycloalkyl, C_5-C_{10} alkylcycloalkylalkyl, C_3-C_8 cycloalkenyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_3-C_8 cycloalkoxy, C_3-C_8 halocycloalkoxy, C_4-C_{10} cycloalkylalkoxy, C_2-C_8 alkenyloxy, C_2-C_8 alkynyloxy, C_1-C_8 alkylthio, C_1-C_8 alkylsulfinyl, C_1-C_8 alkylsulfonyl, C_3-C_8 cycloalkylthio, C_3-C_8 cycloalkylsulfinyl, C_3-C_8 cycloalkylsulfonyl, C_4-C_{10} cycloalkylalkylthio, C_4-C_{10} cycloalkylalkylsulfinyl, C_4-C_{10}

cycloalkylalkylsulfonyl, C_2-C_8 alkenylthio, C_2-C_8 alkenylsulfinyl, C_2-C_8 alkenylsulfonyl, C_2-C_8 alkynylthio, C_2-C_8 alkynylsulfinyl or C_2-C_8 alkynylsulfonyl; or

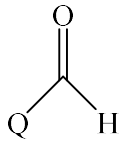
two R^A substituents on adjacent ring atoms are taken together to form a 5- to 7-membered carbocyclic or heterocyclic ring, each ring containing ring members selected from carbon atoms and up to 3 heteroatoms independently selected from up to 2 O, up to 2 S, and up to 3 N, wherein up to 2 carbon atom ring members are independently selected from C(O) and C(=S) and such ring is optionally substituted with up to 3 substituents independently selected from the group consisting of halogen, hydroxy, C_1-C_4 alkyl, C_1-C_4 haloalkyl, C_2-C_4 alkenyl, C_2-C_4 haloalkenyl, C_2-C_4 alkynyl, C_2-C_4 haloalkynyl, C_3-C7 cycloalkyl, C_3-C7 halocycloalkyl, C_4-C_8 alkylcycloalkyl, C_4-C_8 haloalkylcycloalkyl, C_4-C_8 cycloalkylalkyl, C_4-C_8 halocycloalkylalkyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_2-C_8 alkoxycarbonyl, C_2-C_6 haloalkoxycarbonyl, C_2-C_6 alkylcarbonyl and C_2-C_6 haloalkylcarbonyl;

each of R^2 and R^3 is indepedently H, F, C_1-C_4 alkyl or C_1-C_4 haloalkyl; and

M is an inorganic cation or organic cation;

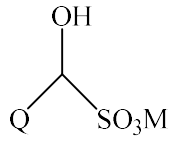
comprising:

(a) contacting a compound of Formula **A**



Formula A

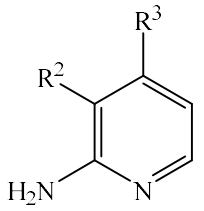
with a salt comprising at least one bisulfite salt, at least one metabisulfite salt, or mixtures thereof to form a compound of Formula **E**



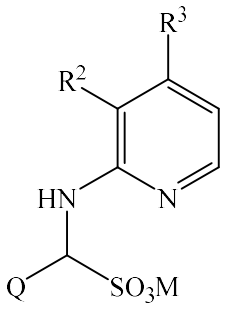
Formula E

wherein M is at least one inorganic cation, at least one organic cation, or mixtures thereof derived from the salt; and

(b) contacting the compound of Formula E from Step (a) with a compound of Formula **J** to form a compound of Formula **B**



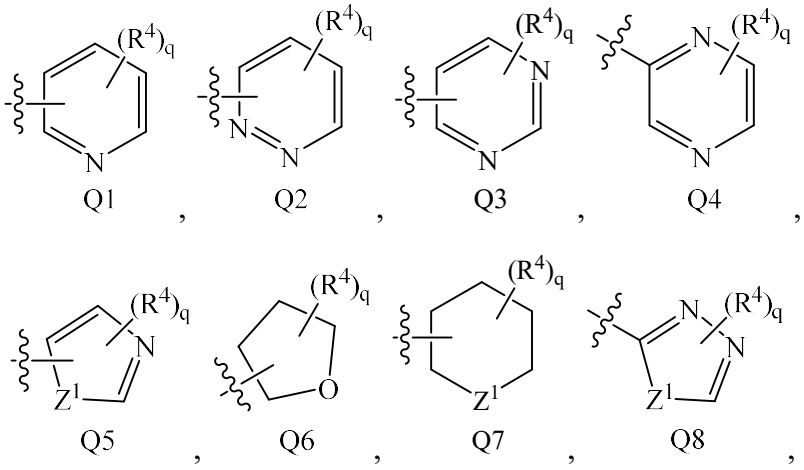
Formula J



Formula B.

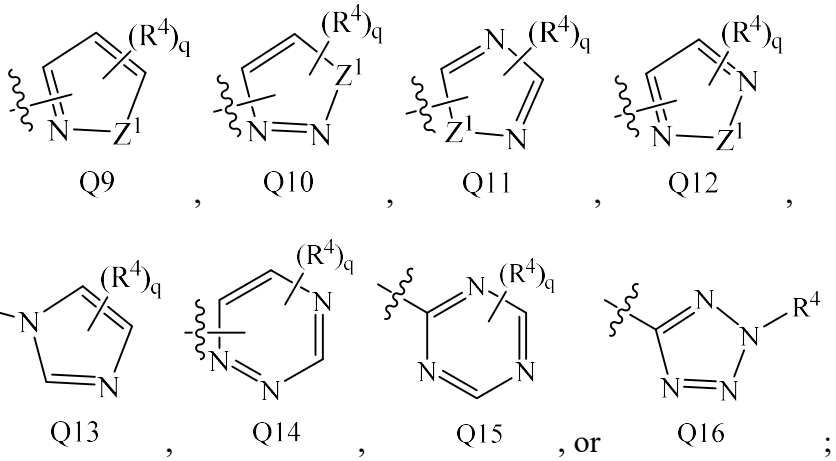
17. The method of claim 16, wherein Q is triazolyl, pyridinyl, or pyrimidinyl, each optionally substituted with up to 2 substitutions independently selected from the group consisting of halogen, C_1-C_8 alkyl, C_1-C_8 haloalkyl, C_3-C_{10} cycloalkyl, C_3-C_{10} halocycloalkyl, C_1-C_8 alkoxy, C_1-C_8 haloalkoxy, C_3-C_8 cycloalkoxy, C_3-C_8 halocycloalkoxy, and C_4-C_{10} cycloalkylalkoxy.

18. The method of claim 16, wherein Q is selected from one of the following ring structures:



Q1 , Q2 , Q3 , Q4 ,

Q5 , Q6 , Q7 , Q8 ,



Q9 , Q10 , Q11 , Q12 ,

Q13 , Q14 , Q15 , or Q16 ;

wherein Z^1 is O, S, or NR^5;

each R^4 or R^5 is independently H, halogen, hydroxy, SF_5, $C(O)(C_1\text{-}C_8$ alkyl), $C(O)O(C_1\text{-}C_8$ alkyl), $N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $C(O)N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $C(=S)N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $SO_2N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $OC(O)(C_1\text{-}C_8$ alkyl), $OC(O)O(C_1\text{-}C_8$ alkyl), $OC(O)N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $N(C_1\text{-}C_8$ alkyl)$C(O)O(C_1\text{-}C_8$ alkyl), $N(C_1\text{-}C_8$ alkyl)$C(O)N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $OSO_2(C_1\text{-}C_8$ alkyl), $OSO_2N(C_1\text{-}C_8$ alkyl)$(C_1\text{-}C_8$ alkyl), $N(C_1\text{-}C_8$ alkyl)$SO_2(C_1\text{-}C_8$ alkyl), or $C_1\text{-}C_8$ alkyl, $C_1\text{-}C_8$ haloalkyl, $C_2\text{-}C_8$ alkenyl, $C_2\text{-}C_8$ alkynyl, $C_3\text{-}C_{10}$ cycloalkyl, $C_3\text{-}C_{10}$ halocycloalkyl, $C_4\text{-}C_{10}$ alkylcycloalkyl, $C_4\text{-}C_{10}$ cycloalkylalkyl, $C_6\text{-}C_{14}$ cycloalkylcycloalkyl, $C_5\text{-}C_{10}$ alkylcycloalkylalkyl, $C_3\text{-}C_8$ cycloalkenyl, $C_1\text{-}C_8$ alkoxy, $C_1\text{-}C_8$ haloalkoxy, $C_3\text{-}C_8$ cycloalkoxy, $C_3\text{-}C_8$ halocycloalkoxy, $C_4\text{-}C_{10}$ cycloalkylalkoxy, $C_2\text{-}C_8$ alkenyloxy, $C_2\text{-}C_8$ alkynyloxy, $C_1\text{-}C_8$ alkylthio, $C_1\text{-}C_8$ alkylsulfinyl, $C_1\text{-}C_8$ alkylsulfonyl, $C_3\text{-}C_8$ cycloalkylthio, $C_3\text{-}C_8$ cycloalkylsulfinyl, $C_3\text{-}C_8$ cycloalkylsulfonyl, $C_4\text{-}C_{10}$ cycloalkylalkylthio, $C_4\text{-}C_{10}$ cycloalkylalkylsulfinyl, $C_4\text{-}C_{10}$ cycloalkylalkylsulfonyl, $C_2\text{-}C_8$ alkenylthio, $C_2\text{-}C_8$ alkenylsulfinyl, $C_2\text{-}C_8$ alkenylsulfonyl, $C_2\text{-}C_8$ alkynylthio, $C_2\text{-}C_8$ alkynylsulfinyl or $C_2\text{-}C_8$ alkynylsulfonyl; and

each q is independently 0, 1, or 2.

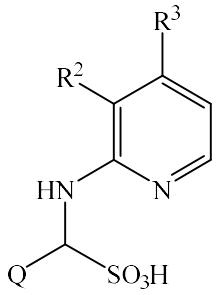
19. The method of claim 16, wherein the salt comprises sodium bisulfite, potassium bisulfite, ammonium bisulfite, trimethylammonium bisulfite, triethylammonium bisulfite, sodium metabisulfite, potassium metabisulfite, ammonium metabisulfite, trimethylammonium metabisulfite, triethylammonium metabisulfite, or mixtures thereof.

20. The method of claim 16, wherein M is sodium, potassium, ammonium, trimethylammonium, triethylammonium, lithium, or mixtures thereof.

21. The method of claim 16, wherein Step (a) is performed in the presence of a solvent comprising water, C_1-C_4 monohydric alcohol, C_2-C_6 polyhydric alcohol, or mixtures thereof.

22. The method of claim 16, further comprising:

(c) contacting the compound of Formula **B** from Step (b) with an acid selected from at least one inorganic acid, at least one organic acid, or mixtures thereof to form a compound of Formula **C**:



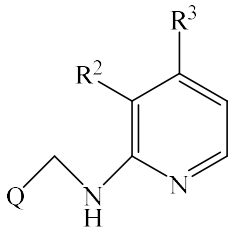
Formula C.

23. The method of claim 22, wherein the acid comprises an inorganic acid selected from hydrochloric acid (HCl), hydrobromic acid (HBr), phosphoric acid (H_3PO_4), sulfuric acid (H_2SO_4), and boric acid (H_3BO_3).

24. The method of claim 22, wherein the acid comprises an organic acid selected from formic acid, acetic acid, propionic acid, citric acid, malic acid, and sulfonic acids.

25. The method of claim 22, further comprising:

(d) contacting the compound of Formula **B** from Step (b) or the compound of Formula **C** from Step (c) with a reducing agent to form the compound of Formula **D**

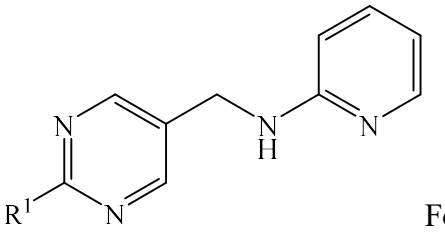


Formula D.

26. The method of claim 25, wherein the reducing agent comprises a borohydride reducing agent selected from sodium borohydride ($NaBH_4$), sodium triacetoxyborohydride ($NaBH(CH_3COO)_3$), lithium borohydride ($LiBH_4$), potassium borohydride (KBH_4), or mixtures thereof.

27. The method of claim 25, wherein the reducing agent comprises lithium aluminium hydride ($LiAlH_4$), diisobutylaluminium hydride (DIBALH), or mixtures thereof.

28. The method of claim 25 for preparing a compound of Formula **1**

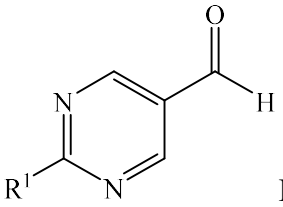


Formula 1

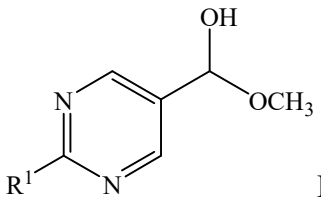
wherein R^1 is H or C_1-C_3 alkyl,

comprising:

(A) contacting a compound of Formula **2** or Formula **2a**

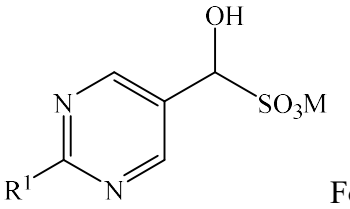


Formula 2 or



Formula 2a

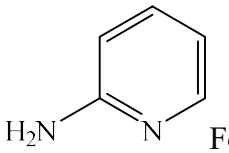
with a salt consisting of a bisulfite salt, a metabisulfite salt, or a mixture of a bisulfite salt and a metabisulfite salt in the presence of a solvent to form a compound of Formula **6**



Formula 6

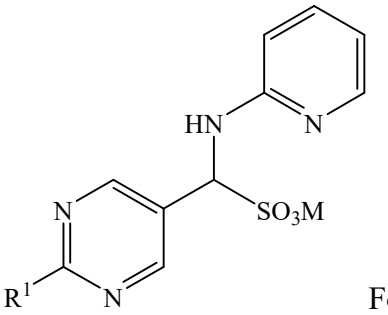
wherein R^1 is H or C_1-C_3 alkyl and M is an inorganic or organic cation;

(B) contacting the compound of Formula **6** with 2-aminopyridine (**3**)



Formula 3

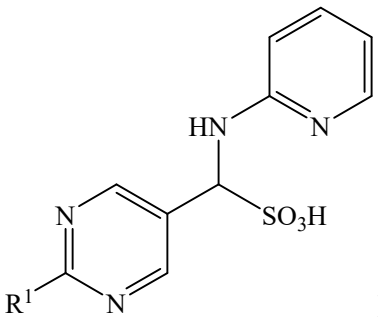
in the presence of a solvent to form a compound of Formula **4**



Formula 4

wherein R^1 is H or C_1-C_3 alkyl and M is an inorganic or organic cation;

(C) contacting the compound of Formula **4** with an inorganic or organic acid in the presence of a solvent to form a compound of Formula **5**



Formula 5

wherein R^1 is H or C_1-C_3 alkyl; and

(D) contacting the compound of Formula **5** with a borohydride reducing agent in the presence of an inorganic or organic base and a solvent to form the compound of Formula **1**.