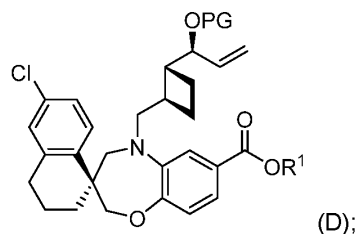


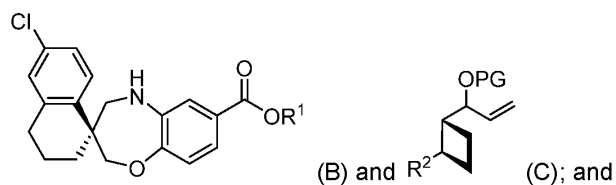
What is Claimed is:

1. A process for synthesizing compound D:



comprising:

(a) admixing compound B, or a salt thereof, and compound C in an organic solvent to form a slurry, wherein the organic solvent is selected from the group consisting of a nonpolar aromatic solvent, an ether solvent, a chlorinated solvent, an alcohol solvent, acetonitrile, dimethylformamide (DMF), dimethylcarbonate, dimethylacetamide (DMAc), N-methylpyrrolidinone (NMP), and a combination thereof:



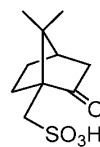
(b) admixing the slurry of step (a) and a reducing agent to form a mixture comprising compound D;

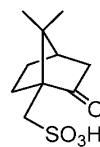
wherein:

OPG is an alcohol protecting group selected from the group consisting of an ether, an acetal or ketal, an acyl, a sulfonyl, and a silyl ether;

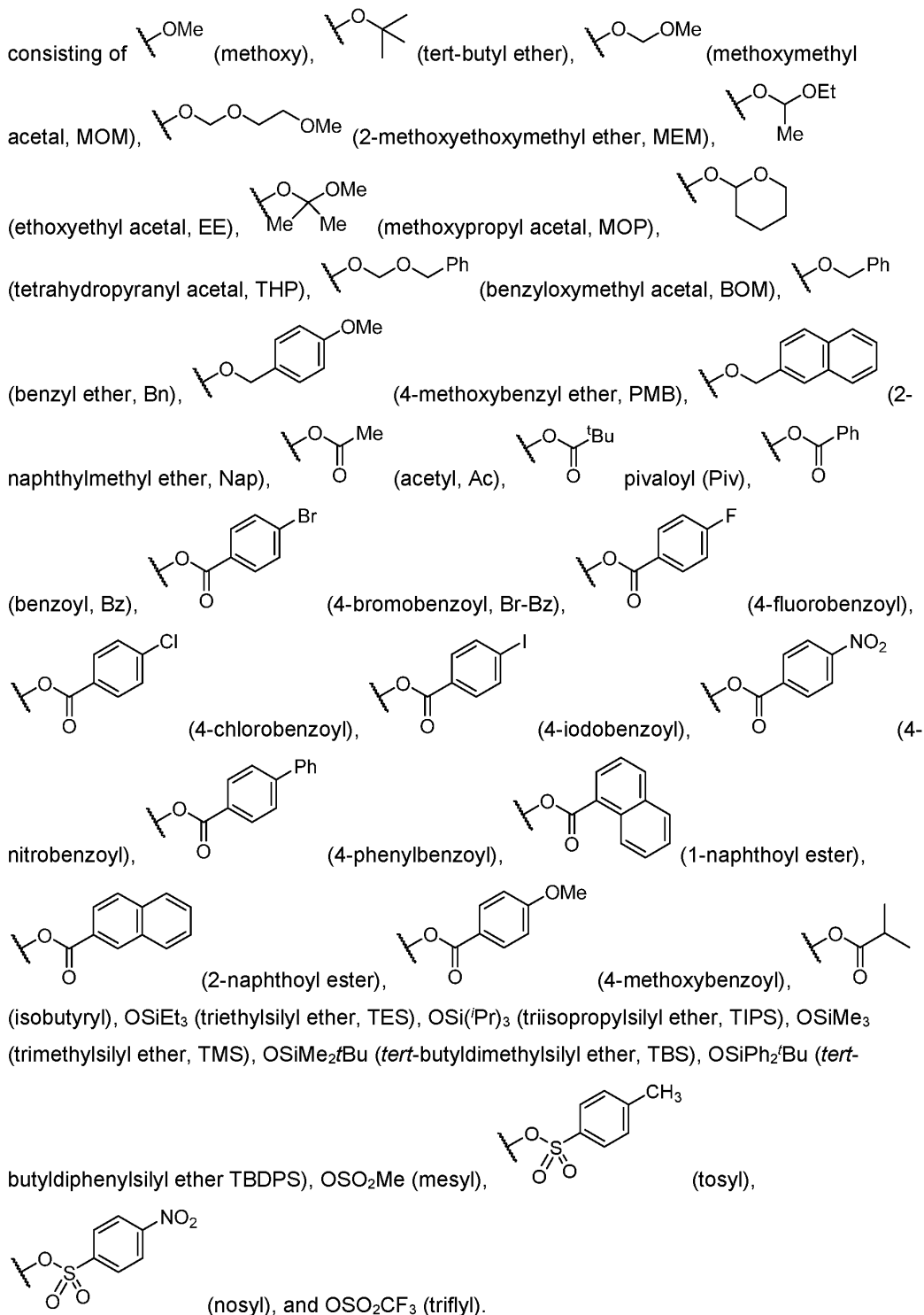
R¹ is H or C₁₋₆alkyl; and

R² is a protected aldehyde.

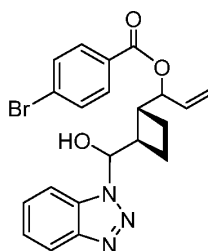


2. The process of claim 1, further comprising admixing  in the organic solvent in step (a).
3. The process of claim 2, wherein compound B is a salt.
4. The process of claim 1 or 2, wherein R¹ is H.
5. The process of claim 1 or 2, wherein R¹ is methyl, ethyl, n-propyl, or *tert*-butyl.

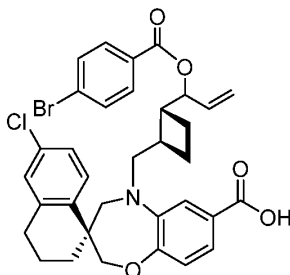
6. The process of any one of claims 1-5, wherein OPG is selected from the group



7. The process of claim 6, wherein OPG is 4-bromobenzoyl.



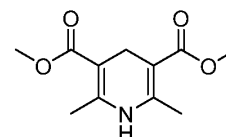
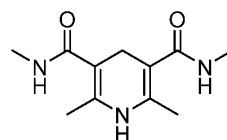
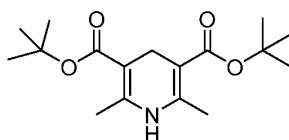
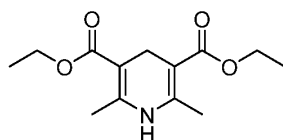
12. The process of any one of claims 1-4, wherein compound D has a structure:



13. The process of any one of claims 1-12, wherein the reducing agent is selected from the group consisting of a borohydride, a borane, a silane, a Hantzsch ester, a formic acid/amine base/metal catalyst, and a hydrogen/metal catalyst.

14. The process of claim 13, wherein the reducing agent is selected from the group consisting of $\text{NaBH}(\text{OAc})_3$, NaBH_3CN , NaBH_4 , picoline borane (pic-BH_3), borane tetrahydrofuran ($\text{BH}_3\text{-THF}$), decaborane ($\text{B}_{10}\text{H}_{14}$), borane dimethyl sulfide ($\text{BH}_3\text{-S}(\text{Me})_2$), an N-heterocyclic

carbene borane (NHC-borane), triethylsilane, phenylsilane, diphenylsilane,



, H_2/Pd , H_2/Rh , H_2/Ir , H_2/Ru , formic acid/triethylamine/ Rh , formic acid/triethylamine/ Ir , and formic acid/triethylamine/ Ru .

15. The process of claim 14, wherein the reducing agent is $\text{NaBH}(\text{OAc})_3$.

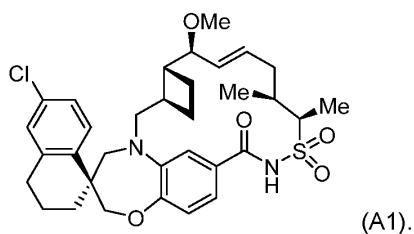
16. The process of any one of claims 1-15, wherein the organic solvent is selected from the group consisting of toluene, benzene, xylene, tetrahydrofuran (THF), tetrahydropyran, tetrahydrofurfuryl alcohol, diethyl ether, dibutyl ether, diisopropyl ether, dimethoxymethane, 1,2-dimethoxyethane, 1,4-dioxane, dichloromethane (DCM), carbon tetrachloride, chloroform, 1,2-dichloroethane, 2-methyltetrahydrofuran (2-MeTHF), methyl tert-butyl ether (MTBE), and a combination thereof.

17. The process of claim 16, wherein the organic solvent is selected from the group consisting of toluene, THF, DCM, and a combination thereof.
18. The process of claim 17, wherein the organic solvent is toluene.
19. The process of any one of claims 1-18, wherein compound B and compound C are present in a molar ratio of B:C of 1:1 to 1:2.
20. The process of claim 19, wherein the molar ratio of B:C is 1:1.1.
21. The process of any one of claims 1-20, wherein compound B and the reducing agent are present in a molar ratio of 1:1 to 1:2.25.
22. The process of claim 21, wherein the molar ratio of compound B to the reducing agent is 1:1.25.
23. The process of any one of claims 1-22, wherein each of step (a) and step (b) occurs at a temperature of 10 °C to 40 °C.
24. The process of claim 23, wherein each of step (a) and step (b) occurs at a temperature of 20 °C.
25. The process of any one of claims 1-24, wherein the admixing of step (a) occurs for 1 minute to 1 hour.
26. The process of claim 25, wherein the admixing of step (a) occurs for 30 minutes.
27. The process of any one of claims 1-26, wherein the reducing agent is added to the slurry within 60 seconds.
28. The process of any one of claims 1-26, wherein the reducing agent is added to the slurry over 10 minutes to 1 hour.
29. The process of claim 28, wherein the reducing agent is added to the slurry in two or more equal portions.
30. The process of claim 29, wherein the reducing agent is added to the slurry in four equal portions.
31. The process of claim 29 or 30, wherein the equal portions are added 15 minutes apart.
32. The process of any one of claims 1-31, wherein the admixing of step (b) occurs for 5 hours to 20 hours.
33. The process of claim 32, wherein the admixing of step (b) occurs for 16 hours.
34. The process of any one of claims 1-33, wherein steps (a) and (b) occur in sequence in a single reaction vessel.
35. The process of any one of claims 1-34, further comprising
 - (c) extracting compound D from the mixture of step (b).
36. The process of claim 35, wherein the extracting is via crystallizing compound D.
37. The process of claim 36, wherein the crystallizing is performed with an organic solvent selected from the group consisting of toluene, benzene, xylene, tetrahydrofuran (THF), tetrahydropyran, tetrahydrofurfuryl alcohol, heptane, diethyl ether, dibutyl ether, diisopropyl ether, dimethoxymethane, dimethoxyethane (DME), 1,4-dioxane, dichloromethane (DCM),

carbon tetrachloride, chloroform, 1,2-dichloroethane, methyl tert-butyl ether (MTBE), 2-methyltetrahydrofuran (2-MeTHF), and a combination thereof.

38. The process of claim 37, wherein the crystallizing is performed with toluene and heptane.

39. The process of any one of claims 1-38, further comprising synthesizing compound A1, or a salt or solvate thereof, using compound D:



40. The process of any one of claims 1-38, further comprising synthesizing compound A2, or a salt or solvate thereof, using compound D:

